

April 8, 1999

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Dear Messrs. Ross, Leach and Kou:

Enclosed is the First Quarter 1999 Quarterly Groundwater Monitoring Report for Phibro-Tech, Inc., Santa Fe Springs facility. The Report includes analytical results and physical measurements obtained January 19-21, 1999 from selected monitoring wells at Phibro-Tech. Since this Report includes portions of the RCRA Facility Investigation (USEPA Docket No. RCRA 09-89-0001), this Report is also submitted to EPA.

Based on a technical review by our consultant, Camp Dresser and McKee, a groundwater monitoring program is included which was implemented beginning with the April 1991 groundwater monitoring. Additional wells and parameters changed at the request of EPA are included in this Groundwater Monitoring Report. The changes are described in the Report. Please contact me if you have any questions or comments concerning this Report.

Very truly yours,

E. E. Viail

Environmental and Safety Manager

EEV/kn/rwqcbqtgw

Enclosure

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Phil Chandler California EPA DTSC Region 3 1011 N. Grandview Avenue Glendale, CA 91201 January 1999 QUARTERLY SAMPLING REPORT AND ANNUAL GROUNDWATER MONITORING PHIBRO-TECH, INC.

Santa Fe Springs, California

April 6, 1999

Prepared for:

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Section 1 Introduction

This report summarizes the 51st RCRA quarterly groundwater monitoring sampling and analyses period at the Phibro-Tech, Inc. (PTI), Santa Fe Springs, California facility (formerly referred to as Southern California Chemical). Contained herein are the results of laboratory analyses of groundwater samples and water level measurements obtained during the period of January 19 to January 22, 1999.

The purpose of the groundwater sampling program, which began in March 1985, is to determine if hazardous waste constituents are migrating from the facility to the groundwater beneath the site. This is accomplished through the comparison of background or upgradient water quality and groundwater quality beneath the site. Statistically-significant increases in contaminant concentrations between known areas of groundwater contamination and downgradient wells would indicate that migration is occurring. In the past, statistical analysis was performed annually and was included in the July quarterly monitoring reports. Statistical analysis is now conducted each quarter and is included in the corresponding monitoring report. The January 1999 statistical analysis is contained in Appendix E of this report.

To date, three types of contaminants have generally been detected in the groundwater beneath the site: soluble metals (primarily chromium and cadmium), purgeable aromatic organic compounds (toluene, ethylbenzene and total xylenes) and purgeable halogenated organic compounds (i.e., solvents, primarily trichloroethene [TCE]). Groundwater modeling completed in January 1993, and groundwater monitoring conducted since 1985, indicate that the purgeable aromatic plume originated upgradient from the PTI facility. The distribution of TCE appears to be ubiquitous, however, somewhat elevated concentrations exist in the vicinity of Pond 1, a RCRA-regulated former surface impoundment area. Elevated concentrations of soluble metals have also been consistently detected in the vicinity of Pond 1. Soluble metal concentrations at the downgradient property line and in deeper wells, however, continue to be negligible to non-detect.

Approximately 15 years of quarterly groundwater monitoring at the PTI facility has indicated a general lack of hexavalent chromium migration. During groundwater modeling performed by CDM in 1993, a retardation factor of 50 was selected based on the observed distribution of hexavalent chromium in the groundwater. Previous data analysis indicated that the most likely basis for the relatively high (but within the range of reasonable and appropriate values) retardation factor would be the existence of reducing conditions in the saturated zone, promoting the conversion of hexavalent chromium to trivalent chromium (Cr ³+). Trivalent chromium, having a very low solubility in water, would tend to precipitate and sorb to the soil, limiting migration. During four quarterly sampling events conducted in 1996, additional laboratory analyses (iron and redox potential) were performed on groundwater samples collected from wells MW-04, MW-09, and MW-14S. These additional data, along with the pH, total chromium, and hexavalent chromium data, provided a better understanding of the mechanisms controlling chromium migration in groundwater underlying the facility and supported the above hypothesis. Please refer to Section 6.4 (Chromium Fate and Transport) of the October 1996 Quarterly Sampling Report for a detailed discussion of this conclusion.

In addition to the data obtained during the January 1999 sampling, this report contains tables listing detection limits of the parameters analyzed (Appendix A). Copies of the original laboratory results are included in Appendix B. Chain-of-custody records for the January 1999 sampling are included in Appendix C. Appendix D contains background groundwater concentrations of contaminants for the Santa Fe Springs area for the year 1996. Appendix E contains the complete quarterly statistical analysis.

Prior to October 1993, quarterly reports have included analytical result summary tables from all previous sampling rounds. Starting with the October 1993 quarterly report, historical water quality data tables are no longer included in the report as an appendix. Please refer to Appendix B in the July 1993 Quarterly Sampling Report for a summary of historical groundwater analytical data. A summary table of key historical results since January 1989 is provided in Section 6 (Table 6-1) of this report.

Section 2 Monitoring Well Sampling

Groundwater sampling, utilizing existing on-site monitoring wells, was conducted by CDM personnel during the period of January 19 to January 22, 1999. Field activities were performed in general accordance with the groundwater sampling protocol as outlined in Section 4.3.3 of the approved RCRA Facility Investigation (RFI) Work Plan (CDM, June 1990). Prior to the submittal of the RFI Work Plan for regulatory agency review and approval, the J.H. Kleinfelder and Associates (Kleinfelder) Quality Assurance Project Plan (QAPP, May 1988) was used as the primary groundwater sampling guidance document. Proposed deviations from the RFI Work Plan (i.e., well purging using a submersible pump and sample collection using disposable bailers) were discussed in October 1994 correspondence to the DTSC. These changes were implemented during the October 1994 and all subsequent sampling events.

Twenty-four monitoring wells exist on-site. The locations of these wells are shown on Figure 2-1. One well, MW-06A, historically has not been sampled for groundwater analysis because it is screened in the Gage Aquifer, which is unsaturated below the PTI facility. The remaining wells are screened in the Hollydale Aquifer; 16 in the upper portion and seven in the lower portion of the aquifer.

Beginning in February 1985, Kleinfelder initiated groundwater sampling, utilizing monitoring wells MW-01 through MW-06B. Six additional wells (MW-04A and MW-07 through MW-11) were installed at the site in July 1985, thereby increasing the total number of active wells to 12. Quarterly sampling of the 12 wells was initiated in March 1986.

Commencing with the January 1989 sampling event, CDM has been responsible for all groundwater monitoring activities at the facility. Ten wells (MW-01D, MW-06D, MW-12S, MW-12D, MW-13S, MW-13D, MW-14S, MW-14D, MW-15S and MW-15D) were constructed as part of the first phase of the RFI program and were first sampled during the October 1990 sampling round.

Groundwater analysis of the 22 wells which existed during the RFI program from October 1990 to January 1991, indicated that the number of wells sampled could be reduced and yield comparable results to sampling all the wells. During the April, July, and October 1991, and January 1992 sampling rounds, the 11 wells sampled included 8 wells (MW-01S, MW-03, MW-04, MW-07, MW-09, MW-11, MW-14S, and MW-15S) screened in the upper portion of the Hollydale Aquifer and three wells (MW-01D, MW-04A, and MW-15D) screened in the lower portion of the Hollydale Aquifer.

Beginning with the April 1992 sampling round, three additional wells (MW-06B, MW-06D, and MW-16) were included in the quarterly monitoring program, bringing the total number of sampled wells to 14. A new well, MW-16, constructed in March 1992 as part of the Phase II RFI program, was sampled for the first time during the April 1992 sampling round. The same 14 wells have been sampled during all subsequent sampling rounds. On several occasions, additional laboratory analyses have been performed and additional wells included in quarterly sampling, at the request of the U.S. EPA. Additional analyses and wells are noted in the comments column of Table 2-1, which summarizes the groundwater monitoring program at the site.

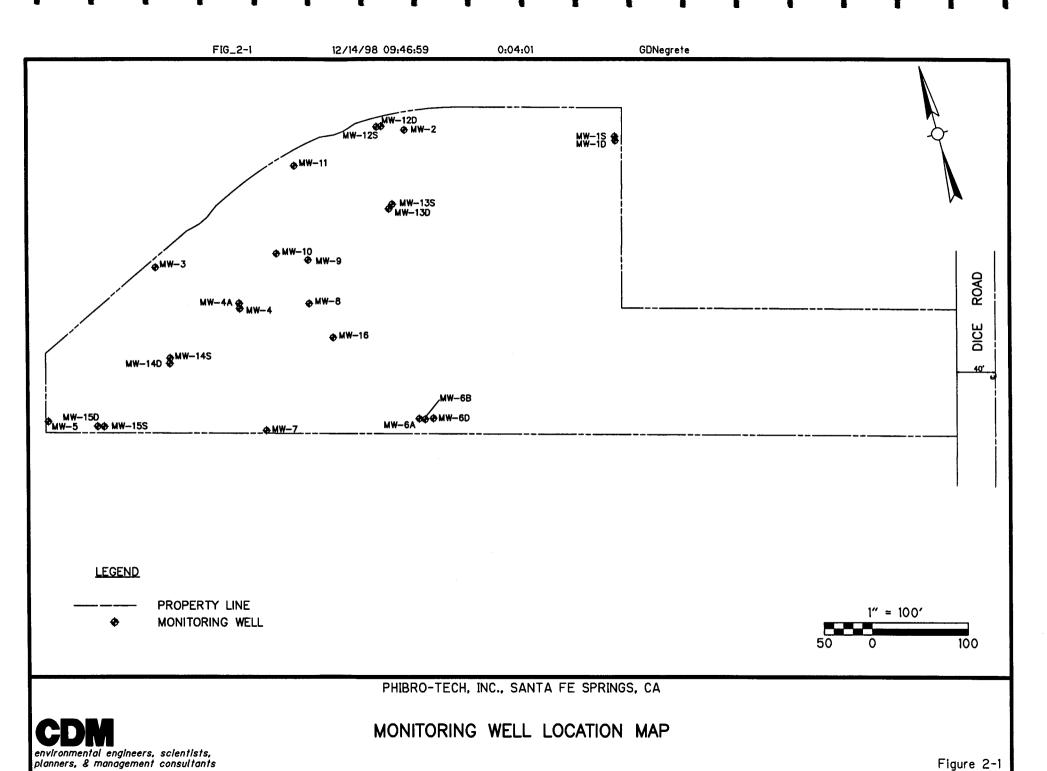


Figure 2-1

Sampling Event	Indicator Parameters	Trace Metals	Hexavalent Chromium	Chloride	Nitrate	Volatile Organics	Appendix IX	Comments
3/85	Quad	Cu & Zn	х	X	х			Sampled wells MW-1, 2, 3, 4, 5, & 6B. Sulfide, nickel, copper and zinc requested by DOHS and RWQCB. Also Appendix III parameters and water quality parameters (see footnote).
7/85	Quad	Cd, Cr	х		х			Sampled wells MW-4A, 7, 8, 10 and 11
3/86	Quad	Cu & Zn	х	х	х			Sampled 12 wells (MW1, 2, 3, 4, 4A, 5, 6B, 7, 8, 9, 10 & 11). Also Appendix III parameters and water quality parameters (see footnote).
7/86	Quad	Cd, Cr, Cu, Zn	х	х	х	624		Sampled all 12 wells (as previous)
9/86	Quad	Cd, Cr, Cu, Zn	х	х	х	624		Sampled all 12 wells (as previous)
12/86	Quad	Cd, Cr, Cu, Zn	х	х	х	624		Sampled all 12 wells (as previous)
3/87	Quad	Cd, Cr, Cu, Zn	х	х	х	601/602	_	Sampled 11 wells, not 4A
7/87	Quad	Cd, Cr, Cu, Zn	х	х	х	601/602	_	After July 1987, all 12 wells were sampled during each event
10/87	Quad	Cd, Cr, Cu, Zn	х	х	х	601/602		After July 1987, all 12 wells were sampled during each event

Sampling Event	Indicator Parameters	Trace Metals	Hexavalent Chromium	Chloride	Nitrate	Volatile Organics	Appendix IX	Comments
2/88	Quad	Cd, Cr, Cu, Zn	х	х	Х	601/602	-	After July 1987, all 12 wells were sampled during each event
6/88	X (not Quad)	Cd, Cr, Cu, Zn	X	х	х	601/602		Performed statistical analysis (t-test) on Indicator Parameters (IPs).
9/88	_	Cd, Cr, Cu, Zn	х	х	х	601/602		IPs & volatile organics from MW1, 2, 4A, 5, 6, 7 analyzed semi-annually in June/Dec.
1/89	Quad	Cd, Cr, Cu, Zn	х	х	х	601/602		After Jan. 1989, volatile organics analyzed for all 12 wells.
4/89	-	Cd, Cr, Cu, Zn	х	х	х	601/602	-	
7/89	Quad	Cd, Cr, Cu, Zn	х	х	х	601/602		Performed statistical analysis of Jan. thru July 1989 data (IPs, total and hexavalent chromium).
10/89	-	Cd, Cr, Cu, Zn	х	х	х	601/602		
1/90	Quad	Cd, Cr, Cu, Zn	х	х	х	601/602	-	
4/90		Cd, Cr, Cu, Zn	х	х	х	601/602		
7/90	Quad	Cd, Cr, Cu, Zn	х	х	х	601/602	-	Performed statistical analysis of Jan. 1989 data (IPs, total and hexavalent chromium).
10/90		Cd, Cr, Cu, Fe, Ni, Pb, Zn	х	X	x	601/602	. X	Sampled 22 wells, Appendix IX parameters analyses were performed on wells 4, 4A, 6B, 6D, 12S, 12D, 15S, 15D, plus a duplicate of 4.

Sampling Event	Indicator Parameters	Trace Metals	Hexavalent Chromium	Chloride	Nitrate	Volatile Organics	Appendix IX	Comments	
1/91	Quad	Cd, Cr, Cu, Fe, Ni, Pb, Zn	х	х	х	601/602		Sampled 22 wells.	
4/91	рН	Cd, Cr, Cu	х		-	601/602		New sampling program was initiated. Sampled 11 wells including wells MW-01S, MW-01D, -03, -04, -04A, -07, -09, -11, -14S, -15S, -15D.	
7/91	pН	Cd, Cr, Cu	х			601/602		Performed annual statistical analysis.	
10/91	pН	Cd, Cr, Cu	х			601/602			
1/92	pH only (all) TOC only (MW-01 & -04)	Cd, Cr, Cu	х		Ammonia as nitrogen (MW-01 & -04)	601/602		Ammonia & TOC analyses added at MW-01S and MW-04.	
4/92	pH only TOC only (MW-01 , -04, - 09, -14S)	Cd, Cr, Cu-all see coments	х		Ammonia as nitrogen (MW-01, -04, -09, -14S)	601/602	EDB (MW-04) TPH (W-16)	Sampled 14 wells including Wells MW-01S, -01D, -03, -04, -04A, -06B, -06D, -07, -09, -11, -14S, -15S, -15D, -16. Additional analysis as part of Phase II RFI; unfiltered metals on MW-04S and -14S. Pb and Ni on wells 1, 4, 14S, 15S, 16; Fe, Zn on well 16.	
7/92	pН	Cd, Cr, Cu	х			601/602	-	Sampled 14 wells. Performed annual statistical analysis.	
10/92	pН	Cd, Cr, Cu	х	-		601/602		Sampled 14 wells.	

Sampling Event	Indicator Parameters	Trace Metals	Hexavalent Chromium	Chloride	Nitrate	Volatile Organics	Appendix IX	Comments	
1/93	pН	Cd, Cr, Cu	Х	-	****	8010/8020	_	Sampled 14 wells.	
4/93	рН	Cd, Cr, Cu	х	-		8010/8020		Sampled 14 wells.	
7/93	рН	Cd, Cr, Cu	х	-		8010/8020 (TVPH, TEPH)	-	Sampled 15 wells. (MW-13S was added) TVPH and TEPH analysis on MW-09, 13S, and 16 only. Performed annual statistical analysis.	
10/93	pН	Cd, Cr, Cu	х	-		8010/8020	· <u></u>	Sampled 15 wells (MW-13S not analyzed for metals and pH) TVPH & TEPH analysis on MW-04, 07, 09, 13S, and 16 only. Performed statistical analysis.	
1/94	рН	Cd, Cr, Cu	х			8010/8020		Sampled 14 wells Performed statistical analysis.	
4/94	pН	Cd, Cr, Cu	х		-	8010/8020	-	Sampled 14 wells Performed statistical analysis	
7/94	рН	Cd, Cr, Cu	х	See comment		8010/8020	-	Sampled 14 wells, chloride and sulfate analyses on MW-04, MW-09, MW-14S, MW- 15S, MW-15D, and MW-16. Performed statistical analysis	
10/94	pН	Cd, Cr, Cu	х	-		8010/8020		Sampled 14 wells Performed statistical analysis.	

Sampling Event	Indicator Parameters	Trace Metals	Hexavalent Chromium	Chloride	Nitrate	Volatile Organics	Appendix IX	Comments	
1/95	pН	Cd, Cr, Cu	х		-	8010/8020		Sampled 14 wells Performed statistical analysis.	
4/95	pН	Cd, Cr, Cu	х			8010/8020		Sampled 14 wells Performed statistical analysis.	
7/95	рН	Cd, Cr, Cu	х	-		8010/8020		Sampled 14 wells Performed statistical analysis.	
10/95	pН	Cd, Cr, Cu	х		-	8010/8020		Sampled 14 wells Performed statistical analysis.	
1/96	рН	Cd, Cr, Cu	х			8010/8020		Sampled 14 wells Performed statistical analysis. 1995 Annual Report included as Appendix F.	
4/96	pН	Cd, Cr, Cu	х			8010/8020		Sampled 14 wells Performed statistical analysis.	
7/96	рН	Cd, Cr, Cu	х			8010/8020		Sampled 14 wells Performed statistical analysis.	
10/96	pH	Cd, Cr, Cu	х			8010/8020		Sampled 14 wells Performed statistical analysis. 1996 Annual Report included as Appendix F.	

Sampling Event	Indicator Parameters	Trace Metals	Hexavalent Chromium	Chloride	Nitrate	Volatile Organics	Appendix IX	Comments	
1/97	pН	Cd, Cr, Cu	х			8260, MTBE		Sampled 14 wells Performed statiscal analysis.	
4/97	pН	Cd, Cr, Cu	х	_		8260		Sampled 14 wells Performed statistical analysis.	
7/97	pН	Cd, Cr, Cu	х	-		8260		Sampled 14 wells Performed statistical analysis.	
10/97	рН	Cd, Cr, Cu	х			8260		Sampled 14 wells Performed statistical analysis. 1997 Annual Report included as Appendix F.	

Sampling Event	Indicator Parameters	Trace Metals	Hexavalent Chromium	Chloride	Nitrate	Volatile Organics	Appendix IX	Comments	
1/98	рН	Cd, Cr, Cu	х		-	8260		Sampled 14 wells Performed statistical analysis. Hexavalent Chromium by Method 7196 in all wells; and by Method 218.6 in wells MW-4A, MW-14S, MW-15S, and MW-15D.	
4/98	рН	Cd, Cr, Cu	Х		-	8260		Sampled 14 wells Performed statistical analysis.	
7/98	рН	Cd, Cr, Cu	х	-	-	8260	-	Sampled 14 wells Performed statistical analysis.	
10/98	рН	Cd, Cr, Cu	х	-	-	8260		Sampled 14 wells Performed statistical analysis.	
1/99	pН	Cd,Cr,Cu	х	_	_	8260		Sampled 14 wells Performed statistical analysis.	

Appendix III Parameters -

As, Ba, Cd, Cr, F, Pb, Hg, N, Se, Ag, Endrin, Lindane, Methoxychlor, Toxaphene, 2,4-D, 2,4,5-TP (Silvex), Radium, Gross Alpha & Beta, Turbidity, coliform bacteria.

Water Quality Parameters -

Cl, Fe, Mn, Phenols, Na, SO4

Indicator Parameters (IP) -

TOX, TOC, pH, EC (quadruplicate) Volatile organics analysis

624 -601/602 -

8010/8020 -

Purgeable halocarbons/aromatics analysis Purgeable halocarbons/aromatic analysis

8260 -MTBE - Purgeable halocarbons/aromatic analysis

Appendix IX Parameters -

Methyl tertiary butyl ether

See Appendix F in the October 1990 Quarterly Sampling Report for a complete listing of parameters.

The 14 wells currently included in quarterly sampling are MW-01S, MW-01D, MW-03, MW-04, MW-04A, MW-06B, MW-06D, MW-07, MW-09, MW-11, MW-14S, MW-15S, MW-15D, and MW-16. Ten shallow and four deep wells are analyzed for pH, metals (cadmium, chromium, and copper using EPA Method 6010A; and hexavalent chromium using EPA Method 7.196), and purgeable halogenated/aromatic organic compounds (EPA Method 8260). A detailed listing of analytical parameters per sampling event is provided in Table 2-1.

Beginning with the July 1993 sampling event, the 14 wells have generally been purged and sampled in the following order: MW-01, MW-01D, MW-03, MW-11, MW-06B, MW-06D, MW-07, MW-04A, MW-04, MW-14S, MW-15D, MW-15D, MW-16, and MW-09.

2.1 Sampling Procedure

Field sampling was conducted in general accordance with procedures detailed in the RFI Work Plan. Sampling practices included efforts to detect floating product and hydrocarbon vapors at each well, measurement of the static water level and total depth of each well for calculating presampling evacuation volumes, purging and sampling of groundwater for laboratory analysis, decontamination of sampling equipment, and handling of sample-filled containers in accordance with Section 4.3.3.5 of the RFI Work Plan. In general, these procedures were consistent with previous quarterly sampling by Kleinfelder. Details of previous procedures have been discussed in prior Quarterly Sampling Reports.

2.1.1 Organic Vapor Check

Standard field procedures include checking the interior of each well with a photoionization detector (PID) (equipped with a 10.0 eV lamp) for the presence of organic vapors whenever the well casing is opened. With the sampling team members standing upwind of the well, the well cap was opened slightly, allowing for the insertion of the PID probe tip inside the well. Readings were monitored until they stabilized, which was usually at zero parts per million (ppm). The final reading, as well as the peak reading, were recorded in the field log book. The cap was then removed and the well allowed to vent for a short period of time prior to measuring the static water level. The maximum PID readings taken during the collection of water level measurements are shown in Table 5-1 in Section 5.

2.1.2 Detection of Immiscible Layers

In order to detect the presence of floating, immiscible layers on top of the groundwater surface, a clear bailer was lowered approximately one-half the length of the bailer below the surface of the water in each well. The bailer was removed from the well and its contents checked for immiscible layers or iridescence. The PID probe was also inserted inside the bailer to check for volatile emissions. If immiscible fluids had been detected, a sample would have been collected for laboratory analysis of purgeable halocarbons and aromatics (EPA Method 8260) and total petroleum hydrocarbons (California Department of Health Services [CA DHS] Method). The bailer was decontaminated and the sampling line discarded after each use. As in all previous quarterly groundwater sampling at the PTI facility by CDM, immiscible layers were not detected during the January 1999 sampling event.

2.1.3 Static Water Level/Well Depth Measurement

On January 19, 1999, prior to the initiation of on-site well pumping, the static water level at 22 of the 24 on-site wells was measured three times at each well location with a decontaminated electric water level indicator (sounder) and recorded. The measurements collected in the wells were identical, therefore, there was no need to collect additional measurements or average the data of these wells. The results of these measurements are shown in Table 5-1 and discussed in Section 5. One well (MW-06A) was dry, and MW-02 was not measured due to its proximity to MW-12S.

The water level in each well was also measured immediately prior to initiating well evacuation procedures for calculation of well purge volume. During measurement, the measuring (reference) point used was noted (i.e., the top of the steel casing), and the depth to water below the reference point was measured to the nearest 0.01 foot and recorded in the field log book. Well head elevation data was used with depth to water measurements to calculate groundwater elevation at each well location.

The bottom of each well sampled was also measured with the sounder to the nearest 0.1 foot. The amount of fill material in the bottom of the well was calculated from well construction data and noted in the log book. Prior to first use, the sounder was calibrated and the meter response checked. The sounder probe and line were decontaminated after each use.

2.1.4 Purge Volume Determination/Well Evacuation

Saturated casing volume was calculated at each well by using the depth to water and bottom sounding measurements obtained immediately prior to purging, to calculate the amount (height) of the saturated well casing. The inside diameter of the casing was then measured, and the following formula applied:

Volume = π radius² x height

A minimum of three saturated casing volumes of water were evacuated from each well prior to collecting a groundwater sample for laboratory analysis.

During the January 1999 sampling round, all 14 of the wells currently monitored were purged using a Grundfos 2-inch diameter submersible pump, and each well was sampled using a new disposable bailer.

For measurement of field parameters during well evacuation, a Hach Model 2100P turbidity meter, a Hanna pH/temperature meter, and a YSI Model 33 electrical conductivity (EC) meter were used. The instruments were calibrated or field checked prior to use with standard solutions in accordance with manufacturer's directions. The meters are used to determine the stability of discharge water field parameters prior to collection of a sample for laboratory analysis.

Periodically during well evacuation, the field parameters of the discharge water were measured and recorded in the log book. The physical appearance of the water (turbidity, color, sediment content, etc.) was also noted and recorded. Initial field turbidity measurements generally ranged from 2.7 to 343 NTUs (nephelometric turbidity units) at the start of well evacuation. At the end of well

evacuation, measurements were generally less than 10 NTUs. Higher turbidity at the start of purging seems to be related to agitating the water column and resuspending material from the bottom of the well during pump installation. After a minimum of three saturated casing volumes of water were evacuated from each well and the field parameters stabilized (change between readings of less than 5 to 10 percent), a sample for laboratory analysis was collected.

All purge water collected from each well was discharged directly into 55-gallon barrels for treatment by PTI in the facility's wastewater treatment system.

2.1.5 Sample Collection and Handling

Groundwater samples were collected with a disposable bailer from the approximate middle of the perforated section, and poured directly into previously-labeled sample bottles. During sample collection, the bailer was carefully and gently lowered past the air/water interface to minimize agitation and aeration of water during sample collection. The sample bottles were placed inside plastic zip-lock bags and then placed immediately into an ice-cooled chest. Prior to shipment, the bottles were cushioned with bubble wrap or plastic bags to avoid breakage. Samples collected for total metals analysis were field filtered using a 0.45 micron filter. Filters were discarded after each use.

The January 1999 groundwater samples were collected for laboratory analysis of the following parameters:

- Halogenated/Aromatic Volatile Organic Compounds by EPA method 8260
- Metals (Cd, Cu, and Cr)
- Hexavalent Chromium (Cr+6)
- pH

Groundwater sample bottles were numbered using the following format: PTI-MW01S-042

Where:

PTI - designates site acronym

MW01S - designates sample location number (MW = Monitoring Well)

EB - designates equipment blank sampleTB - designates travel blank sample

042 - designates sequential sample number (per sampling event)

This was the 41th round of sampling conducted by CDM, however, due to a previous labeling inconsistency, a 042 sequence number was assigned to all groundwater samples collected during this round. Sample label information included date and time of sampling, CDM sample number, and analytical parameters.

All filled sample containers that were collected from each well were accompanied by chain-ofcustody forms that indicated the label information as well as the responsible person during each step of the transportation process. All samples were sent by courier to Quanterra Laboratories in Santa Ana, California on the day that they were collected, and a copy of the chain-of-custody form for that day was retained by CDM field personnel. Copies of completed chain-of-custody forms are included in Appendix C. The laboratory was notified at the time of delivery that one or more hexavalent chromium (Cr^{+6}) sample(s) were contained in the shipment to ensure that the samples would be analyzed within the prescribed 24-hour holding period.

2.2 Equipment Decontamination Procedures

The following sections describe the procedures utilized to decontaminate groundwater sampling equipment.

2.2.1 Sampling Pump/Lines Decontamination

The submersible pump and discharge tubing used for well purging were decontaminated to reduce the possibility of cross-contamination between monitoring wells. The first step in the decontamination procedure was to submerge the pump into a decontaminated 5-gallon bucket containing a soap (Alconox, a laboratory-grade detergent) and water mixture, and pump at least five gallons of the solution through the system. The pump assembly was then submerged in another 5-gallon bucket filled with tap water and at least 10 gallons were pumped through the system. The final decontamination step was accomplished by submerging the pump into a decontaminated 5-gallon bucket containing deionized (DI) water and pumping approximately five gallons of DI water through the system.

The exterior of the pump and discharge tubing was steam cleaned, as well as the exterior of the reel holding the tubing. The decontamination of the exterior pump line was performed over a plastic waterproof tarp. The tarp was placed on a gently sloping surface and bermed up at the edges, allowing the decontamination water to flow away from the equipment being cleaned. The spent water was recovered and stored in 55-gallon drums for treatment by PTI in the facility's wastewater treatment system.

2.2.2 Accessory Sampling Equipment Decontamination

Accessory sampling equipment such as the metals filter apparatus, bailer, and water level sounder were also decontaminated to minimize the possibility of cross-contamination between the monitoring wells. The filter apparatus, bailer, and sounder were decontaminated first by washing in a bucket of soap and water, followed by a tap water rinse, followed by a final DI water rinse. Bailers used to test for an immiscible layer were decontaminated and reused. The bailers and nylon rope that were used to sample wells were discarded immediately after use.

Section 3 Laboratory Testing

Analytical and duplicate testing of groundwater samples collected during the January 1999 monitoring event was provided by Quanterra Laboratories of Santa Ana, California. During the January 1999 quarterly sampling event, a total of 21 water samples were submitted for laboratory analysis. Fourteen monitoring well samples and two blind duplicate samples from MW-04 and MW-16 were collected and submitted to Quanterra for analysis of purgeable halocarbons/aromatics (EPA Method 8260), cadmium, total and hexavalent chromium, copper, and pH. In addition, two equipment blank samples were submitted for analysis of the above parameters. Three travel blanks (TB) were also submitted to Quanterra for analysis of purgeable halogenated/aromatic organics.

The January 1999 groundwater analytical results are discussed in Section 6 and summarized in Tables 6-1 through 6-4. Quality assurance analytical results (duplicates, equipment blanks, and travel blanks) are discussed in Section 4.0 and summarized in Tables 4-1 through 4-4. Individual analytical reports for January 1999 are contained in Appendix B.

Section 4 Quality Assurance

To verify the accuracy and validity of analytical data, certain quality assurance procedures were implemented. The field and laboratory quality assurance results were checked for deviations from the Quality Assurance (QA) guidelines discussed in the RFI Work Plan.

4.1 Field Quality Assurance

The field QA procedures included the use of duplicate samples, equipment blanks, travel blanks, and the use of chain-of-custody forms. The results of the QA analyses have been compiled by type of parameter: purgeable halogenated organics, purgeable aromatic organics, and inorganics, in Tables 4-1 through 4-3, respectively. Table 4-4 lists quality assurance results which are outside the ranges specified in the RFI Work Plan. Detection limits of parameters analyzed are shown in the analytical reports contained in Appendix B.

4.1.1 Duplicate Samples

Standard accepted practice is to submit one duplicate sample for analysis for approximately every tenth sample collected, a ratio of 1 to 10. During the January 1999 round of sampling, duplicate samples were collected from monitoring wells MW-04 and MW-16. The duplicate samples were submitted to the analytical laboratory as blind samples, and were designated MW-35 and MW-37, respectively, on the chain of custody forms. Monitoring wells MW-04 and MW-16 were selected due to elevated concentrations of certain contaminants detected during previous sampling rounds. Analytical results for the duplicate samples for January 1999 are shown in Tables 4-1, 4-2, and 4-3.

Duplicate results which deviate greater than 20% from the original results are shown in Table 4-4. There was a 58% difference in hexavalent chromium and a 43% difference in methylene chloride (a halogenated volatile organic compound) between sample PTI-MW04-042 and its duplicate, PTI-MW35-042.

4.1.2 Equipment Blanks

Analytical results for the equipment blanks collected during January 1999 are shown in Tables 4-1, 4-2 and 4-3.

Equipment blank EB-01 was obtained by allowing deionized water to run through a new, precleaned, disposable bailer. The other equipment blank (EB-02) was obtained by pouring deionized water over the submersible pump after decontamination. The samples were collected in the appropriate containers and submitted for laboratory analysis. Sample EB-01 was collected to evaluate the effectiveness of the factory cleaning process. Sample EB-02 was collected following pump decontamination after sampling well MW-16. The equipment blanks were submitted to the laboratory for analysis of purgeable halogenated/aromatic volatile compounds (EPA Method 8260), cadmium, chromium (total and hexavalent), copper, and pH. The analytical results did not indicate any detections above the method detection limits in equipment blank EB-01, but cadmium (0.0066 mg/L) and total chromium (2.5 mg/L) were detected in equipment blank EB-02.

TABLE 4-1 PHIBRO-TECH, INC. January 1999 Quarterly Monitoring Well Sampling Quality Assurance Samples Purgeable Halogenated Organic Analytical Results (ug/L)

Sample Identification	Tetrachloro- ethene (PCE)	Trichloro- ethene (TCE)	1,1-Dichloro- ethene (1,1-DCE)	1,1-Dichloro- ethane (1,1-DCA)	1,2-Dichloro- ethane (1,2-DCA)	1,1,1- Trichloro- ethane (1,1,1-TCA)	Chloroform (CHCL3)	Methylene chloride (CH2CL2)
PTI-EB01	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0
PTI-EB02	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0
PTI-MW04	ND <10	260	60	140	33	ND <10	35	140
PTI-MW04-DUP	ND <10	290	71	170	40	ND <10	42	200
PTI-MW16	ND <2.0	36	17	170	41	ND <2.0	ND <2.0	ND <2.0
PTI-MW16-DUP	ND <2.0	38	17	180	42	ND <2.0	ND <2.0	ND <2.0
PTI-TB01	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0	2.1
PTI-TB02	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0	1.2
PTI-TB03	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0

All analyses performed by EPA Method 8260. ND = Analytical parameter not detected

MW = Monitoring Well

MW-DUP = Monitoring Well - Duplicate

EB01 = Equipment Blank collected from a new disposable bailer.

EB02 = Equipment Blank collected from the submersible pump.

TB = Travel Blank

TABLE 4-2 PHIBRO-TECH, INC.

January 1999 Quarterly Monitoring Well Sampling Quality Assurance Samples Purgeable Aromatic Organic Analytical Results (µg/L)

Sample Identification	Benzene	Toluene	Ethyl- benzene	Xylenes (Total)
PTI-EB01	ND <0.50	ND <1.0	ND <1.0	ND <1.0
PTI-EB02	ND <0.50	ND <1.0	ND <1.0	ND <1.0
PTI-MW04	ND <5.0	ND <10	520	31
PTI-MW04-DUP	5.2	ND <10	530	34
PTI-MW16	ND <1.0	ND <2.0	11	ND <2.0
PTI-MW16-DUP	ND <1.0	ND <2.0	12	2.0
PTI-TB01	ND <0.50	ND <1.0	ND <1.0	ND <1.0
PTI-TB02	ND <0.50	ND <1.0	ND <1.0	ND <1.0
PTI-TB03	ND <0.50	ND <1.0	ND <1.0	ND <1.0

All analyses performed by EPA Method 8260.

ND = Analytical parameter not detected.

NA = Parameter not analyzed.

MW = Monitoring Well

MW-DUP = Monitoring Well - Duplicate

EB01 = Equipment Blank collected from a new disposable bailer.

EB02 = Equipment Blank collected from the submersible pump.

TB = Travel Blank

TABLE 4-3 PHIBRO-TECH, INC.

January 1999 Quarterly Monitoring Well Sampling Quality Assurance Samples Inorganic Analytical Results (mg/L)

Well Identification	Cadmium EPA- 6010-L	Chromium (Hexavalent) EPA- 7196	Chromium (Total) EPA-6010-L	Copper EPA-6010-L	pH EPA-9040
PTI-EB01	ND <0.0050	ND <0.020	ND <0.010	ND <0.020	7.8
PTI-EB02	0.0066	ND <0.020	2.5	ND <0.020	6.8
PTI-MW04	0.58	78.6	85.2	ND <0.040 ^G	6.4
PTI-MW04-DUP	0.61	124	87.3	ND <0.040 ^G	6.4
PTI-MW16	ND < 0.0050	ND < 0.020	ND < 0.010	ND < 0.020	6.8
PTI-MW16-DUP	ND < 0.0050	ND < 0.020	ND < 0.010	ND < 0.020	7.0

ND = Analytical parameter not detected.

NA = Parameter not analyzed.

MW = Monitoring Well

MW-DUP = Monitoring Well - Duplicate

EB01 = Equipment Blank collected from a new disposable bailer.

EB02 = Equipment Blank collected from the submersible pump.

^G - Reporting limit(s) raised from 0.020 mg/L due to matrix interference.

TABLE 4-4 PHIBRO-TECH, INC. January 1999 Quarterly Monitoring Well Sampling Quality Assurance Deviations

Quality Assurance Criteria	Cadmium (mg/l)	Chromium, Hexavalent (mg/l)	Chromium, Total (mg/l)	Copper (mg/l)	Benzene (ug/l)	Toluene (ug/L)	Ethyl- Benzene (ug/l)	Xylenes, Total (ug/l)	Halogenated Volatile Organic Compounds (ug/l)
Equipment Blanks									
PTI-EB01- 042									
PTI-EB02- 042	0.0066		2.5						
Travel Blanks									
PTI-TB01- 042									2.1
PTI-TB02- 042									1.2
PTI-TB03- 042									
Laboratory Blanks									
Method Blank									
Duplicate Deviation (>20%)									
PTI-MW04- 042		58%							43%
PTI-MW16- 042									
Holding Time Exceedance									

0.01/0.01 = Concentration/Detection Limit

MW - DUP = Monitoring Well - Duplicate

EB01 = Equipment Blank collected from a new disposable bailer. EB02 = Equipment Blank collected from the submersible pump.

TB = Travel Blank

4.1.3 Travel Blanks

The detection of compounds in travel blanks is generally indicative of systematic contamination from sample transport, laboratory glassware cleaning, laboratory storage, or analytical procedures. During the January 1999 sampling event, three laboratory-prepared travel blanks (TB01 through TB03) consisting of organic-free water were labeled and submitted to the lab for purgeable halocarbon and aromatic volatile organic analysis by EPA Method 8260. Each travel blank was stored with the day's samples, to be analyzed for volatile organic compounds. Tables 4-1 and 4-2 show the results of the travel blank analyses. The analytical results indicated that methylene chloride was detected in TB-01 (2.1 ug/L) and in TB-02 (1.2 ug/L). Methylene chloride was not detected in any of the groundwater samples shipped with the travel blanks TB-01 or TB-02. Therefore, the prescence of methylene chloride can likely be attributed to laboratory procedures.

4.1.4 Sample Control

All sample containers were labeled immediately prior to sampling with the sample identification information completed with a waterproof pen. Samples were transported under chain-of-custody and hand delivered by courier to the laboratory in ice-cooled chests. Copies of the chain-of-custody records are included in Appendix C.

4.2 Laboratory Quality Assurance

General QA procedures for Quanterra Laboratory, which performed laboratory analysis on all monitor well and quality assurance samples, are discussed in the RFI report. Quanterra provides internal laboratory QA/QC results with each sample analytical report. Matrix spike, matrix spike duplicate, method blank, and duplicate control sample results are noted in the QA/QC reports. In addition, surrogate recoveries are also noted for volatile organics analyses. The laboratory QA/QC results were within acceptable limits for the January 1999 sampling. The laboratory control sample results were also within acceptable limits.

Section 5 Groundwater Elevation

On January 19, 1999, prior to the initiation of well evacuation procedures, the depth to groundwater was measured in 22 of the 24 on-site monitoring wells. Groundwater elevations were calculated by subtracting the depth to static water level from the surveyed elevation of the corresponding monitoring well.

- All of the monitoring well casing elevations were surveyed during the RFI and three wells (MW-04, MW-09, and MW-10) were resurveyed in January 1996 following wellhead repair. In July 1998, wellhead repairs were performed on wells MW-03, MW-06A, MW-06B, MW-06D, MW-08, MW-11, MW-12S, MW-12D, MW-13S, MW-13D, and MW-16. These wells were resurveyed during the July 1998 monitoring event.
- During the January 1999 groundwater sampling round, water level measurements were taken at shallow wells MW-01S, MW-03, MW-04, MW-05, MW-06B, MW-07, MW-08, MW-09, MW-10, MW-11, MW-12S, MW-13S, MW-14S, MW-15S, and MW-16. Water level measurements were also taken at deep wells MW-01D, MW-04A, MW-06D, MW-12D, MW-13D, MW-14D, and MW-15D. These wells were measured in order to evaluate the direction and gradient of groundwater flow underlying the facility and to help characterize the shallow and deep aquifer interaction. Well MW-02 was not measured due to its proximity to MW-12S. Well MW-06A was measured and found to be dry.
 - Table 5-1 lists the depths to water and groundwater elevations for each well sampled. Figure 5-1 shows the approximate groundwater surface elevation of the upper Hollydale Aquifer for wells screened in the shallow interval (45 to 77 feet below ground surface) using data collected during the January 1999 sampling round. The contours shown in Figures 5-1 and 5-2 were generated by D.C.A., a surface contouring software developed by Softdisk, which is commonly used in conjunction with CADD (Computer Aided Drafting and Design) to produce contour maps and other graphics.
 - The direction of groundwater flow as observed in the shallow monitoring wells is approximately S 55° W at an average gradient of 0.33 foot per 100 feet in the western portion of the facility, where the majority of the monitoring wells are located. The gradient in the shallow wells is comparable to the October 1998 gradient of 0.32 foot per 100 feet. The flow direction has an increased westward component from that obtained in October 1998 (S 45° W).
 - Figure 5-2 shows the approximate groundwater elevation of the lower Hollydale Aquifer for wells screened in the deeper interval (78.3 to 123.5 feet below ground surface). Groundwater contours for the deeper wells follow the same general trend as those of the shallow wells but show an increased westward componant. The direction of groundwater flow is approximately S 61°W at an average gradient of 0.38 foot per 100 feet. The gradient in the deep wells is consistent with the October 1998 gradient of 0.34 foot per 100 feet, and the flow direction has an increased westward component from that obtained in October 1998 (S 53°W) in the deep wells.

TABLE 5-1
PHIBRO-TECH, INC.
January 1999 Quarterly Monitoring Well Sampling
Groundwater Elevation Data

Well No.	Well Headspace* (ppm)	Total Depth Constructed (ft)	Total Depth Measured (ft)	Perforated Intervals (ft)	Calculated Casing Fill (ft)	M.P. Elevation (ft)	Depth to Water (ft below MP)	G.W. Elevation (ft above MSL)
1S	10.8 / 1.5	62.5	62.6	47-62.5		152.63	38.69	113.94
1D	7.1 / 0.4	94.8	96.0	79.5-94.5		152.60	38.60	114.00
3	69.0 / 3.8	74.1	73.4	45-75	0.7	154.75	42.27	112.48
4	79.5 / 2.0	67.5	67.7	45-75		152.37	39.96	112.41
4A	36.1 / 4.1	107.0	106.7	87-107	0.3	152.46	39.83	112.63
5	54.6 / 6.0	75.0		45-75		153.26	41.39	111.87
6A	-			10-30			DRY	
6B	-	77.6	77.0	45-75	0.6	149.53	36.79	112.74
6D	41.5 / 5.2	95.5	93.4	79-94	2.1	150.13	37.35	112.78
7	-	71.5	71.6	45-75	0.0	149.42	37.14	112.28
8	252.0 / 2.3	71.0		41-71		150.17	37.40	112.77
9	45.9 / 1.0	73.5	73.4	44-77	0.1	152.96	40.28	112.68
10	23.7 / 3.5	75.0		45-75		153.89	41.09	112.80
11	45.5 / 2.7	75.5	74.1	55-75	1.5	155.76	42.71	113.05
12S	-	72.0		51-72		155.79	42.29	113.50
12D	-	101.0		84.5-100		155.72	42.35	113.37
13S	65.1 / 0.8	70.3		50.3-70.3		151.72	38.51	113.21
13D	11.2 / 3.0	93.3		78.3-93.3		151.68	38.47	113.21
14S	28.6 / 13.5	71.5	70.8	46-72	0.8	150.50	38.19	112.31
14D	21.2 / 4.3	109.0		88-103		150.56	38.24	112.32
15S	31.4 / 1.9	71.5	71.5	51.5-71.5	0.0	151.01	39.03	111.98
15D	28.4 / 2.5	123.8	124.0	108.5-123.5		150.96	39.04	111.92
16	51.0 / 3.4	62.5	62.0	42-62	0.5	150.27	37.59	112.68

M.P. = Measuring point (top of steel casing)

MSL = mean sea level

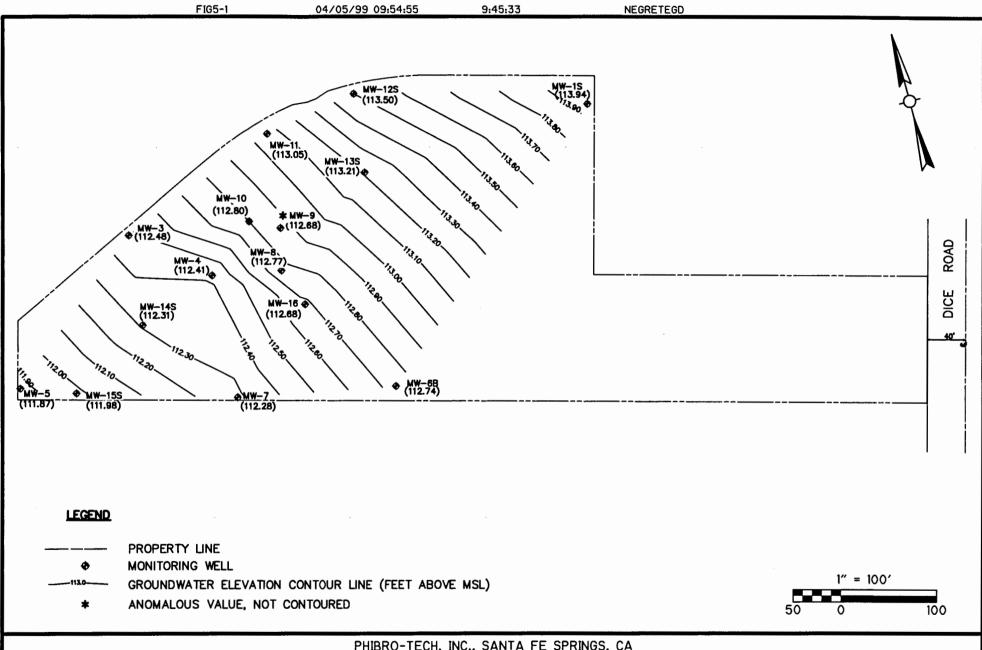
G.W. = Groundwater

* = Measured with PID prior to sampling (casing/background)

Note: Depth to water measurements collected on January 19, 1999 prior to purging/sampling on-site wells.

^{--- =} Not measured or not calculated.

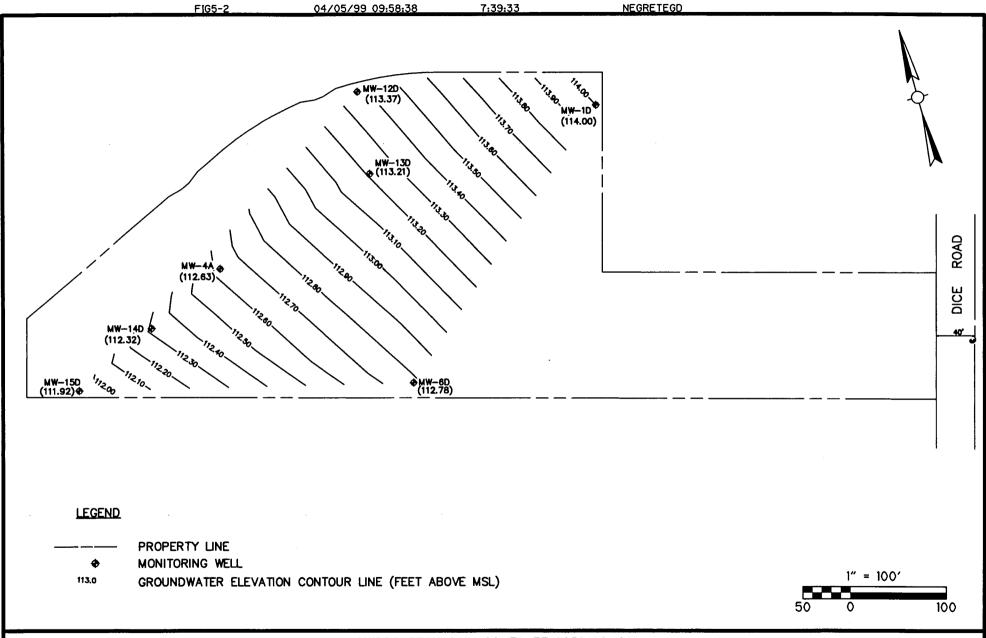
^{- =} Well headspace measurements were not obtained due to PID malfunctions.



PHIBRO-TECH, INC., SANTA FE SPRINGS, CA

environmental engineers, scientists, planners, & management consultants

GROUNDWATER ELEVATION CONTOURS - SHALLOW WELLS JANUARY 1999



PHIBRO-TECH, INC., SANTA FE SPRINGS, CA

environmental engineers, scientists, planners, & management consultants

GROUNDWATER ELEVATION CONTOURS — DEEP WELLS
JANUARY 1999

With the 23 wells measured for water levels during the January 1999 sampling round, there were seven locations where a deep well was measured adjacent to a shallow well. Shallow wells are screened within the interval of 45 to 77 feet. Deep wells are screened within the interval of 78.3 to 107 feet, with the exception of MW-15D which is screened from 108.5 to 123.5 feet. Of the well pairs, groundwater elevations at deep wells MW-12D, and MW-15D were slightly lower (0.13 and 0.06 feet, respectively) than the corresponding shallow well elevations. The groundwater elevations at deep wells MW-1D, MW-4A, MW-06D, and MW-14D were slightly higher (0.01 to 0.22 feet) than the corresponding shallow well elevations. Well pair MW-13S and MW-13D had the same groundwater elevations. Based on these and past groundwater elevation comparisons among shallow and deep well pairs, it does not appear that a well-defined vertical gradient between shallow and deep intervals exists.

Groundwater elevations during the January 1999 sampling event decreased from the previous quarter. Water level decreases ranged from a minimum of 2.09 feet at well MW-6B, to a maximum of 3.07 feet at MW-13S.

Section 6 Groundwater Quality

In order to compare the analytical data from the previous sampling events (1989 through October 1998 quarterly events) with the January 1999 data, Table 6-1 was compiled. This table compares groundwater analytical parameters (hexavalent and total chromium, cadmium, copper, purgeable aromatics and trichloroethene), and groundwater elevations at shallow well locations which were sampled during January 1999. Laboratory analytical reports from all wells sampled during the January 1999 sampling round are located in Appendix B.

Consistent with the results of laboratory testing performed on the groundwater samples collected since January 1989 from the on-site monitoring wells, three contaminant plumes in the Hollydale Aquifer were identified. Historically, these plumes have been present at varying concentrations and lateral extent. One small plume, consisting primarily of site-specific metals parameters, has been aligned in a northeasterly to southwesterly direction in the vicinity of wells MW-04 and MW-14S. The second, consisting of purgeable aromatics, has also been aligned in a northeasterly to southwesterly direction with the highest concentrations generally found in wells MW-04 and MW-09. The third plume consists of trichloroethene and related parameters with highest concentrations generally detected in wells MW-04, MW-09, MW-11, and MW-14S.

6.1 Purgeable Halogenated Organic Compounds

Table 6-2 shows the analytical results for purgeable halogenated organic compounds in deep and shallow wells during January 1999. Trichloroethene was the primary compound detected, with miscellaneous other halogenated organics also detected. The table also shows, for comparison purposes, maximum contaminant limits (MCLs) and concentrations for water supply wells in the Santa Fe Springs area. The supply wells, however, are likely screened much deeper than the wells at PTI. The City of Santa Fe Springs Annual Water Quality Report for 1996 (the most recent report available) is contained in Appendix D of this document.

Trichloroethene

Trichloroethene (TCE) was detected in all 14 of the groundwater monitoring wells sampled during January 1999. The highest concentration of TCE detected in January 1999 was 690 μ g/L in well MW-11, an increase from the result of 430 μ g/L in October 1998. The second highest concentration of TCE detected was 550 μ g/L in well MW-9, a decrease from the result of 1,200 μ g/L in October 1998. The third highest concentration of TCE detected was 260 μ g/L in well MW-04, an increase from the result of 120 μ g/L in October 1998.

Detected concentrations of TCE in a majority of the remaining shallow wells increased slightly in January 1999 from the results in October 1998, and ranged in concentration from 7.0 μ g/L in MW-15S to 160 μ g/L in MW-07. Deep well detections did not change substantially, and ranged from 2.0 μ g/L in MW-01D to 10 μ g/L in MW-04A. Concentrations for TCE detected in shallow and deep wells are shown in Figures 6-1 and 6-2, respectively.

TABLE 6-1 PHIBRO-TECH, INC. January 1999 Quarterly Monitoring Historical Results

					MET				THAT COADDON									
Monitor	Groundwater	METALS Hexavalent Total Cadmium Copper								- B^	nzene	Total	HALOCARBOI Trichloroethen					
Well	Elevation		hromium	C	romium		aumium		Copper	De	Delizarie		Toluene		Ethyl- enzene		Xylenes	Thenoroemen
No. / Date	(Feet MSL)	U	(mg/L)	0	(mg/L)		(mg/L)		(mg/L)		(ug/L)		(ug/L)	٦	(ug/L)		(ug/L)	(ug/L)
MW - 1S	(reet WSL)		(IIIg/L)		(1119/12)		(mg/c)		(mg/L)		(ug/L)		(ug/L)	<u> </u>	(ug/L)		(ug/L/	(dg/L)
Jan-89	96.74	ND	0.01		0.014	ND	0.003	ND	0.009	ND	0.01	ND	0.0	ND	0.0	ND	0.0	19
Apr-89	100.45	ND	0.05		0.1	ND	0.01	ND	0.02	ND	0.7	ND		ND	1.0	-,,,,	3.0	23
Jul-89	99.00	ND	0.05		0.06		0.01		0.03		0.7	ND		ND	1.0	ΝD	1,0	13
Oct-89		ND	0.05	ND	0.02	ND	0.01	ND	0.05	ND	0.5	ND	1.0	ND	1.0	ND	1.0	12
Jan-90	97.73	ND	0.02	ND	0.01	ND	0.01	ND	0.02	ND	0.5	ND		ND	0.5	ND	1.0	16
Apr-90	99.30	ND	0.02		0.02	ND	0.005		0.02	ND	2.5	ND	2.5	ND	2.5	ND	5.0	20
Jul-90	100.83	ND	0.02	ND	0.01	ND	0.01		0.03	ND	0.5	ND	0.5	ND	0.5	ND	1.0	18
Oct-90	99.81	ND	0.02	D	0.01	ND	0.005		0.023	ND	0.5		1.0	ND	1.0	ND	1.0	18
Jan-91	99.19	ND	0.02	ND	0.01	ND	0.005	ND	0.02	ND	0.5	ND	1.0		1.0	ND	1.0	26
Apr-91	101.95	ND	0.02	ND	0.01	ND	0.005	Z	0.02	ND	0.5			ND	1.0	N N	1.0	22
Jul-91	102.94	N D	0.02	N	0.01	ND	0.005	D N	0.02	ND	0.5		1.0		1.0	D Z	1.0	17
Oct-91	102.33	ND	0.02		0.01	ND	0.005		0.02	ND	0.5	N	1.0	ND	1.0	ND	1.0	14
Jan-92	104.60		0.10		0.0081	ND	0.0027			ND	1		1.5		1.2		4.3	13
Apr-92	107.28	ND	0.02	ND	0.01	ND	0.005		0.02	ND		ND		ND		N D	0.5	9.9
Jul-92	107.87	N D		ND	0.01	ND	0.005	ND	0.02	ND		ND		N D		ND	1.0	10
Oct-92	105.53	ΝD	0.02	N D	0.01	ND	0.005		0.035		0.95	N D		N D		ND	1.0	11
Jan-93	109.82	ND	0.02	ND	0.01	ND	0.005		0.02		0.5		2.2	 -	1.3		5.6	9.2
Apr-93	116.01	N D	0.02	ND	0.01	ND	0.005		0.02	ND		ND		N D	1.0	ND	1.0	5.7
Jul-93	116.59	ND	0.02	ND	0.01	ND	0.005		0.02	ND	0.5	ND	1.7 1.0	├─	2.2		4.0 4.3	11 14
Oct-93	116.50 116.60	N D N D	0.02 0.02	D Z Z	0.01	N D	0.005 0.005		0.02	N D		ND		N D		N D	1.0	9.3
Jan-94 Apr-94	117.10			ND	0.01	ND	0.005			ND		ND		ND		ND	1.0	14
Jul-94	117.80	ND	0.02	ND	0.01	ND	0.005		0.02	ND		ND		ND		ND	1.0	7.9
Oct-94	112.23	ND	0.02	ND	0.01	ND	0.005		0.02	ND		ND		N D	1.0		5.8	13
Jan-95	113.59	ND	0.02	ND	0.01	ND	0.005		0.02	ND		ND		N D		ND	1.0	5.2
Apr-95	118.78	ND	0.02	.,,,	0.0029	ND	0.001		0.02	ND		ND	1.0	111	1.3	-	1.0	4.4
Jul-95	120.06	ND	0.02	ND	0.01	ND	0.005		0.02	ND	0.5		1.2		3.5		6.1	6.2
Oct-95	116.48	ND		ND	0.01	ND	0.005		0.02	ND	0.5	N D	1.0		1.7		3.9	15
Jan-96	114.84	ND	0.02	ND	0.01	ND	0.005		0.02	ND		ND	1.0		1.7		5.1	8.4
Apr-96	118.03	ND	0.02	ND	0.01	ND	0.005	ND	0.02	ΝD	0.5	D	1.0		3.4		4.9	2.9
Jul-96	117.42	ND	0.01	ND	0.01	ND	0.005	ND	0.02	D		D	1.0		2.2		3.7	9.7
Oct-96	113.85	ND	0.01	ND	0.01	ND	0.005	ND	0.02	ΝD		ND	1.0		2.1		2.8	16
Jan-97	115.73	ND	0.02	ND	0.01	ND	0.005		0.022	ND		ΝD		ND	1.0		2.0	6.0
Apr-97	118.21	ND	0.02	ND	0.01	ND	0.005		0.020			ND	1.0		1.4		1.2	15
Jul-97	118.18	ΝD	0.02	ND	0.01	ND	0.005	ND	0.020			ND		ΝD		ND	1.0	14
Oct-97	114.82	ND	0.02	ND	0.01	ND	0.005		0.023	ND		N D		N D		ND	1.0	12
Jan-98	113.23	ND	0.02	ND	0.01	ND	0.005	ND	0.02	ND		N D		ND		N D	1.0	12
Apr-98	118.16	ND			0.01	ND	0.005		0.021	ND		ND		ND		N D	1.0	14
Jul-98	119.12	ND	0.02	Z	0.01	ND	0.005		0.02	ND		N D		N D		ND	1.0	14
Oct-98 Jan-99	116.57 113.94	N D N D	0.02	2 2	0.01 0.01	N D	0.005		0.02	N D		N D N D	1.0	ND		N D	1.0 1.0	7.8 10

TABLE 6-1 PHIBRO-TECH, INC. January 1999 Quarterly Monitoring Historical Results

										PURGEABLE AROMATICS HALOCARBO											
		METALS Hexavalentl Totall Cadmium Copper										HALOCARBON									
Monitor	Groundwater	Hexavalent		Hexavalent				(admium		Copper	Be	nzene		Toluene		Ethyl-		Total	Trich	oroethene
Well	Elevation		Chromium	Chromium										В	enzene] 7	Xylenes				
No. / Date	(Feet MSL)		(mg/L)		(mg/L)		(mg/L)		(mg/L)	(ug/L)			(ug/L)		(ug/L)		(ug/L)		(ug/L)		
MW - 3																					
Jan-89	95.02	ND	0.01	ND	0.014	ND	0.003	ND	0.009		7.4		17.0		4900.0		1500.0		74		
Apr-89	99.29		0.05		0.07	ND	0.01	ND	0.02			ND	50.0		1200.0		60.0	ļ	110		
Jul-89	98.21	ND	0.05		0.06	ND	0.01	ND	0.02	ND	7			ND	10.0	ND	10.0	<u> </u>	120		
Oct-89	94.75	ND	0.05	ND	0.02	ND	0.01	N D	0.05	N D		ND	100.0		1600.0	115	150.0	ND	100		
Jan-90	95.98	ND	0.02	ND	0.01	ND	0.01	ND	0.02	ND		ND	5.0	_	110.0	ND	10.0		65		
Apr-90	97.72	ND	0.02	ND	0.01	ND	0.005	ND	0.02	ND		ND	50.0	ND	2100.0	ND	720.0		74		
Jul-90	99.27	ND	0.02	ND	0.01	ND	0.01	N D	0.02	ND		ND	5.0		5.0	N D	10.0		130 130		
Oct-90	97.29	ND	0.02	ND	0.01	N D	0.005	ND	0.02	* 6	9	110	2.0	N D	1.0	ND	1.0		38		
Jan-91	97.69	ND	0.02	ND	0.01	N D	0.005	ND	0.02	N D		N D		ND	1.0 1.0	ND	1.0		27		
Apr-91	99.81	ND	0.02	ND	0.01	ND	0.005 0.005	N D N D	0.02	ND		ZD		ND	1.0	ND	1.0		28		
Jul-91	101.63	N D	0.02	N D	0.01	N D	0.005	ND	0.02	ND		ND		ND	1.0	ND	1.0		71		
Oct-91	100.99	ND	0.02	ND	0.0081	ND	0.0027		0.03	ND	0.5	ND		ND	1.0	IN D	4.0		76		
Jan-92	103.44 106.04	ND	0.05	ND	0.0081	ND	0.0027	ND	0.02	ND		ND	1.0		1.0	ND	0.5		25		
Apr-92	106.04	N D	0.02	NU	0.02	N D	0.005	ND	0.02	ND	0.5	ND		ND	1.0	ND	1.0		76		
Jul-92 Oct-92	103.93	ND	0.02	ND	0.02	ND	0.005		0.13	ND	0.52	ND	1.0		1.0	ND	1.0	 	130		
Jan-93	103.93	ND	0.02	ND	0.02	ND	0.005		0.036	ND	2.5	ND		ND	5.0	ND	5.0		84		
Apr-93	115.17	ND	0.02	ND	0.01	ND	0.005	N D	0.030	ND	0.5	ND	1.0		1.0	ND	1.0	_	12		
Jul-93	115.17	ND	0.02	ND	0.01	ND	0.005		0.02	ND	0.5	NU	3.3	N	2.6	NO	5.9		16		
Oct-93	115.67	ND	0.02	ND	0.01	ND	0.005		0.02	ND	0.5	ND	1.0		2.6		4.8		17		
Jan-94	115.59).02/0.4**	ND	0.01	ND	0.005		0.02	ND	0.5	ND		ND	1.0	ND	1.0		10		
Apr-94	116.33		0.02	ND	0.01	ND	0.005		0.02	ND	0.5	-		ND	1.0	ND	1.0		15		
Jul-94	116.91	ND	0.02	ND	0.01	ND	0.005		0.02	ND	0.5			ND	1.0	ND	1.0		26		
Oct-94	110.85		0.02	ND	0.01	ND	0.005		0.02	1110	1.2	.,,,	3.5	.,,,	1.5	,,,,,	12.0		76		
Jan-95	111.83	ND	0.02	ND	0.01	ND	0.005		0.02	ND	0.5	ND	1.0	ND	1.0	ΝD	1.0		72		
Apr-95	117.83	ND	0.02	7,70	0.0023	ND	0.001	_	0.02	ND	0.5	ND	1.0		1.3	ND	1.0		57		
Jul-95	119.20	ND	0.02	ND	0.01	ND	0.005		0.02	ND	0.5		2.0		5.2		8.8		9.5		
Oct-95	115.45	ND	0.02	ND	0.01	ND	0.005		0.02	ND		ND	1.0		1.7		3.3		30		
Jan-96	113.41	ND	0.02	ND	0.01	ND	0.005		0.02	ND	0.5	ND		ΝD	1.0		5.1		26		
Apr-96	116.73	ND	0.02	ND	0.01	ND	0.005		0.02	ND	0.5	ND	1.0		2.6		3.6		46		
Jul-96	116.33		0.01	ND	0.01	ND	0.005		0.02	ND	0.5		1.8		9.0		12.0		17		
Oct-96	112.45		0.01	ND	0.01	ND	0.005		0.02	ND	0.5	ND	1.0		5.4		6.2		21		
Jan-97	114.19		0.02	ND	0.01	ND	0.005		0.02	ND	0.5		2.6		1.1		4.2		28		
Apr-97	117.13	_	0.02	ND	0.01	ND	0.005	ND	0.02	ND	0.5		4.3		2.1		3.0		13		
Jul-97	117.18	_	0.02	ND	0.01	ND	0.005	ND	0.02	ND	0.5	ND	1.0		2.5		3.7		13		
Oct-97	113.60	_	0.02	ND	0.01	ND	0.005	N D	0.02		0.57	ND	1.0		1.7		1.2		24		
Jan-98	111.68	ND	0.02	ND	0.01	ND	0.005		0.02	ND		ND	1.0		1.3	ND	1.0		25		
Apr-98	116.82	ND	0.02	ND	0.01	ND	0.005	ND	0.02	ND		ND	1.0	ND	1.0	ND	1.0		18		
Jul-98	118.02	ND	0.02	ND	0.01	ND	0.005	ND	0.02	ND	0.5	ND	1.0	ND	1.0	ND	1.0		25		
Oct-98	115.40	ΝD	0.02	D Z	0.01	ND	0.005		0.02	ND	0.5	ND	1.0	ND		ND	1.0		24		
Jan-99	112.48	ND	0.02	ND	0.01	ND	0.005	N D	0.02	ND	0.5	ם צ	1.0		2.3	ND	1.0		26		

^{**} Hexavalent chromium sample or result for MW03 likely switched with MW30 (dup. of MW04). Laboratory reported MW03 res MW30 result of ND at a detection limit of 0.02 mg/L.

1 1			METAL	9						ARON		JRGEAE	DLC	Тна	LOCARBON
Monitor	Groundwater	Hexavalent	Total	Cadmium		Copper	Be	nzene		Toluene	17110	Ethyl-	Tota		chloroethen
Well	Elevation	Chromium	Chromium	Cadmium		Оорры	50	1120110		TOIGOTIO	-	Benzene	Xylenes	1	
No. / Date	(Feet MSL)	(mg/L)	(mg/L)	(mg/L)		(mg/L)		(ug/L)		(ug/L)		(ug/L)	(ug/L)		(ug/L)
MW - 4	(T GOT MIGE)	(111g/2/)	(//ig/2/)	(119/2)	-	(111g/L)		(49/2)		(49/2)		(49/12)	(49/2)	+	(09/2)
Jan-89	95.21	33.0	400.0	0.028	ND	0.009	ND	0.5		10.0		15.0	29.0	1	120
Apr-89	99.19	43.0	100.0	0.05	.,,,,	0.02	ND	5		23.0		15.0	50.0		280
Jul-89	98.19	120.0	98.0	0.08		0.06			ND	20.0		140.0	40.0	+	290
Oct-89	94.92	110.0	120.0	0.07	ΝĎ	0.05			ND		ND	1.0		_	250
Jan-90	95.87	109.0	95.1	0.12	ND	0.02			ND	12.0		12.0			220
Apr-90	97.50	81.7	80.7	0.13		0.02	ND		ND	10.0	ND	10.0			280
Jul-90	99.20	100.0	101.0	0.35	ND	0.02	ND	50	ND	50.0		1600.0	170.0		320
Oct-90	98.33	58.9	48.4	0.23		0.022	Z	0.5		17.0		230.0	650.0		250
Jan-91	97.68	49.4	65.3	0.26	ND	0.02	ND		ND		ND	1.0			180
Apr-91	100.50	23.8	18.4		ND	0.02	N		ND	1.0		730.0			170
Jul-91	101.47	39.1	78.5		ND	0.02	ND	0.5		16000.0		6700.0	18000.0		190
Oct-91	100.91	42.0	40.8	0.21	ND	0.01	ND	0.5		6900.0		4100.0	10000.0		
Jan-92	103.33	41.0	34.0	0.47		0.045	ND	250		18,000		10,000	17,200		
Apr-92	105.94	32.2	29.2	0.84		0.053		6.7		7.2		960.0	1010.0		280
Jul-92	106.5	79.9	59.7	0.86		0.02	ND		ND	10.0		200.0	280.0	_	280
Oct-92	103.92	21.6	27.1	0.32		0.02			ND	10.0		1300.0	230.0		230
Jan-93	107.13	16.4	27.4 2.2 N	0.28 D 0.005		0.02	N D	130	ND	10000.0		10000.0	19000.0		250 25
Apr-93 Jul-93	115 115.52	1.8	23.2	0.005	טא	0.02	NU	0.6	NU	2.0		88.0 1.8	13.0 11.0	_	100
Oct-93	115.52	* 35.5/99.2	80.3	0.71	ND	0.056			ND		N D	1.0	40.0	_	290
Jan-94	115.70	0.36	36.0	0.71		0.02		0.81		1.0	140	8.3	14.0		130
Apr-94	116.20	26.9	26.4	0.33		0.02	ND		ND	1.0		4.0	6.5		190
Jul-94	116.76	59.0	41.4	0.20	.,,,	0.038	.,,,,	0.58		1.0	ND	1.0	4.2		340
Oct-94	110.86	60.7	52.8	0.45	N D	0.02	ND	5	ND	10.0		270.0	39.0		390
Jan-95	111.88	28.8	34.3	0.13		0.026			ND	10.0		350.0	130.0		190
Apr-95	117.69	8.6	9.1	0.21		0.052		100		1600.0		1700.0	2900.0		67
Jul-95	119.05	* 28.1/20.8	29.6	0.27	*.10/	ND<.02	ND	10	* 2	70/410	* 26	50/380	* 890/1300		90
Oct-95	115.35	**30.8	28.9	0.38	ND	0.02	D	2.5	N N	5.0		75.0	21.0		150
Jan-96	113.37	25.7	32.4	0.19		0.02		50		100.0		2100.0	1400.0		160
Apr-96	116.65	* 32.2/24.6	38.0	0.60		0.02		25		680.0		1300.0	1400.0		130
Jul-96	116.17	50	58.9	0.28		0.02			ND	100.0		1000.0	270.0	_	140
Oct-96	112.38	63.8	75.7	0.46	ND	0.04		50		380.0		1100.0	1900.0		310
Jan-97	114.07	*45.9/34.9	34.5	0.54		0.02		6.2	ND_	12.0		1100.0			330
Apr-97	116.96	27.3	18.8	0.53		0.02		12		35.0		1300.0	620.0	-	150
Jul-97	117.04	36.0	35.2	0.62	_	0.02			ND	10.0		810.0	110.0		150
Oct-97	113.46	73.8	85.3	0.64		0.08			ND	10.0		460.0	31.0		230
Jan-98	111.66	39.2	44.0	0.53		0.02	ND		ND	10.0		530.0			180
Apr-98	116.69	7.2	14.1	0.43		0.02	ND	2.9		5.0		320.0			92
Jul-98	117.95 115.31	16.3 34.1	18.9 36.2	0.32 0.44	טא	0.02		6.2	ND	25.0 12.0		1200.0 740.0	300.0 240.0	_	120 120
Oct-98 Jan-99	115.31	78.6	85.2	0.44		0.030		5.0		12.0		520.0	31.0	-	260

^{* 35.5/99.2 =} original sample/duplicate sample (both results presented because duplicate result deviation is >20%)

^{**} Analyzed after holding time had expired.

	1													PL	JRGEAE	BLE		
					MET	ALS							ARON	MATIC				HALOCARBONS
Monitor	Groundwater	He	xavalent		Total	С	admium		Copper	Be	nzene		Toluene		Ethyl-		Total	Trichloroethene
Well	Elevation	С	hromium	Cr	romium									В	enzene	1	Xylenes	
No. / Date	(Feet MSL)		(mg/L)		(mg/L)		(mg/L)		(mg/L)		(ug/L)		(ug/L)		(ug/L)		(ug/L)	(ug/L)
MW - 6B																		
Jan-89	95.12	ND	0.01	ND	0.014	ND	0.003	ND	0.009	ND	0.01	ND		ND	0.0	ND	0.0	57
Apr-89	99.11	ND	0.05		0.06	ND	0.01	ND	0.02	ND	0.7	ND		ND	1.0	ND	1.0	37
Jul-89	98.39	ND	0.05		0.04	ND	0.01	ND	0.02	ND	0.7	ND	1.0	ND	1.0	ND	1.0	29
Oct-89	95.35	ND	0.05	ND	0.02	ND	0.01	ND	0.05	ND	0.5	ND	1.0		1.0	ND	1.0	29
Jan-90	96.1	ND	0.02	ND	0.01	ND	0.01	ND	0.02	ND	0.5	ND		ND	0.5	ND	1.0	46
Apr-90	97.76	ND	0.02		0.02	ND	0.005	ND	0.02	ND	2.5	ND	2.5	ND	2.5	ND	5.0	61
Jul-90	99.28	ND	0.02		0.02	ND	0.01	ND	0.02	N D	0.5	N D	0.5	ND	0.5	ND	1.0	51
Oct-90	98.45	ND	0.02		0.012	ND	0.005	ND	0.02	ND	0.5	N D	1.0	ND	1.0	N N	1.0	52
Jan-91	97.87	ND	0.02	ND	0.01	ND	0.005	ND	0.02	N	0.5	ND	1.0	ND	1.0	ם צ	1.0	59
Apr-92	105.86	ND	0.02		0.014	ND	0.005	ND	0.02	D	0.5	D	0.5		1.1		0.8	19
Jul-92	106.57	ND	0.02		0.019	ND	0.005		0.054	ND	0.5	D	0.5	ND	1.0	D Z	1.0	10
Oct-92	104.12	ND	0.02	ND	0.01	ND	0.005	ND	0.02	ND	0.5		12.0		2.9		13.0	9.3
Jan-93	107.23	ND	0.02		0.011	ND	0.005		0.038	ND	0.5	ND	1.0	ND	1.0	ND	1.0	6.9
Apr-93	114.64	ND	0.02		0.014	ND	0.005	ND	0.02	ND	0.5		64.0		26.0		88.0	2.6
Jul-93	115.34	ND	0.02	ND	0.01	N D	0.005	ND	0.02	ND	0.5		2.2		2.0		5.5	
Oct-93	115.46	ND	0.02		0.011	N D	0.005	ND	0.02	ND	0.5	ND	1.0	ND	1.0	ND	1.0	5.9
Jan-94	115.37	ND	0.02	ND	0.01	N D	0.005	ND	0.02	ND	0.5	ND		ND	1.0	ND	1.0	2.7
Apr-94	116.15	ND	0.02		0.01		0.005		0.02	ND		ND	1.0	ND	1.0	ND	1.0	
Jul-94	116.67	ND	0.02		0.01	D N	0.005	ND	0.02	ND	0.5		1.1		1.0		1.9	2.9
Oct-94	111.13	ND	0.02	ND	0.01		0.005		0.02	ND	0.5		1.5	ND	1.0		8.2	1.5
Jan-95	112.19	ND	0.02		0.01		0.005		0.02	ND	1		110.0		89.0		110.0	
Apr-95	117.42	ND	0.02	N D	0.01	ND	0.005		0.02	ND	0.5		1.6		9.1		6.2	2.3
Jul-95	118.93	ND	0.02		0.01		0.005	ND	0.02	ND	0.5		1.1		4.0		5.1	8.8
Oct-95	115.45	ND	0.02		0.01		0.005		0.02		0.5	ND		ND	1.0		1.0	
Jan-96	113.47	ND	0.02	N D	0.01		0.005		0.02	ND	1		28.0		27.0		53.0	14
Apr-96	116.65	ND	0.02		0.011		0.005		0.02		1		4.2		37.0		50.0	2.9
Jul-96	116.18	N D	0.01		0.01		0.005		0.02	ND	0.5	ND	1.0		2.3		3.5	
Oct-96	112.66	ND	0.01		0.01		0.005		0.02	ND	0.5		1.0		2.1		2.8	
Jan-97	114.20	ND	0.02		0.01		0.005		0.02		0.5		4.3		4.3		6.4	5.0
Apr-97	116.95	ND	0.02		0.01		0.005		0.02	ND	0.5		3.6		1.7	ND	1.0	<u> </u>
Jul-97	117.01	ND	0.02		0.01		0.005		0.02			ND		ND	1.0		1.0	
Oct-97	113.71	ND	0.02		0.01		0.005		0.02			ND	1.0			ND	1.0	
Jan-98	112.06	N D	0.02		0.01		0.005		0.02		0.5		15.0		32.0		39.0	17.0
Apr-98	116.76	ND	0.02		0.01		0.005		0.02		0.5		1.6		4.2		6.0	
Jul-98	117.95	ND	0.02		0.01	N D	0.005		0.02			ND		ND		ND	1.0	
Oct-98	114.83	ND	0.02		0.01		0.005	_	0.02	ND		ND	1.0	_	1.0	ND	1.0	
Jan-99	112.74	ND	0.02	ND	0.01	N D	0.005	ND	0.02	ND	0.5		5.0		24.0		29.0	17.0

															IRGEAB	LE		
					MET								ARON	MATIC	-			HALOCARBONS
Monitor	Groundwater	Hexav			Total	С	admium		Copper	Be	nzene		Toluene		Ethyl-			Trichloroethene
Well	Elevation		mium	Ch	romium			İ						В	enzene		Xylenes	
No. / Date	(Feet MSL)	(1	mg/L)		(mg/L)		(mg/L)		(mg/L)		(ug/L)		(ug/L)		(ug/L)		(ug/L)	(ug/L)
MW - 7																		
Jan-89	89.47	N D		N D	0.014	ND	0.003		0.009	ND	0.5		1.4		1.2		3.6	35
Apr-89	98.83	N D	0.05		0.02	ND	0.01	ND	0.02	ND		ND		ND	1.0	ND	1.0	47
Jul-89	97.90	N D	0.05		0.03	ND	0.01	ND	0.05	ND		ND		ND	1.0	ND	1.0	25
Oct-89	94.72	N D	0.05		0.02	ND	0.01	ND	0.05	ND		ND	1.0	ND	1.0	ND	1.0	44
Jan-90	95.58	N D		ND	0.01	ND	0.01	ND	0.02	N D		ND		ND	2.5	N D	5.0	39
Apr-90	97.32	N D		ND	0.01	ND	0.005	ND	0.02	ND		ND	2.5	ND	2.5	ND	5.0	46
Jul-90	98.85	N D		ND	0.01	ND	0.01	ND	0.02	ND		ND	1.0	ND	1.0	ND	2.0	34
Oct-90	98.02	N D		ND	0.01	ND	0.005	ND	0.02	N D		ND	1.0	ND	1.0	N D	1.0	19
Jan-91	97.41	N D		ND	0.01	ND	0.005	ND	0.02	ND		N D		ND	1.0	ND	1.0	1.8
Apr-91	100.06	N D	* 1	ND	0.01	ND	0.005	ND	0.02	N D		ND			1.0	ND	1.0	30
Jul-91	101.20	N D		ND	0.01	ND	0.005	ND	0.02	N D		ND		ND	1.0	ND	1.0	53
Oct-91	100.62	N D		N D	0.01	ND	0.005		0.01	ND	0.5	ND	1.0		1.0	N D	1.0	54
Jan-92	102.90			N D	0.0081	ND	0.0027		0.14	ND	- 2	D C	1.0	ND	1.0	ND	1.0	120
Apr-92		N D	0.02		0.013	ND	0.005	_	0.032	N D	0.5	ND		ND	1.0	ND	1.0	55
Jul-92	103.13	N D	0.02		0.095	ND	0.005		0.21	ND	- 1	ND	2.0	ND	2.0	ND	2.0	53
Oct-92	103.68	N D	0.02		0.063	ND	0.005		0.65	ND		ND	1.0	ND	1.0	N D	1.0	98
Jan-93	106.82	N D	0.02		0.033	ND	0.005	41.6	0.19	ND		ND	1.0	ND	1.0	ND	1.0	73
Apr-93	114.54	N D	0.02	AL D	0.011	ND	0.005		0.02	N D		ND	2.5		90.0	ND	5.6	23
Jul-93	115.14	N D		ND	0.01	N D	0.005	ND	0.02	ND	0.82	ND	10.0 1.0		210.0 7.2	ND	10.0	43
Oct-93	115.23	N D		N D	0.01	ND	0.005	AL D	0.02		1.4	ND	1.0		33.0	ND	1.0	53
Jan-94	115.08	N D		N D	0.01 0.01	ND	0.005		0.02	N D		ND	5.0		200.0	ND	5.0	96
Apr-94	115.88	N D		ND	0.01	ND	0.005	טא	0.023	ND	0.88		1.0		7.7	ND	1.2	140
Jul-94	116.44	N D		ND	0.01	ND	0.005	ND	0.023	ND		ND	1.0		5.1		5.5	98
Oct-94	110.69	N D		ND	0.01	ND	0.005	ND	0.026	ND	0.5	ND	7.0		8.7		10.0	170
Jan-95 Apr-95	111.59 117.24	N D		ND	0.01	ND	0.005	ND	0.020	ND		ND	1.0		1.3	ND	1.0	26
Jul-95	118.63	ND		ND	0.01	ND	0.005	ND	0.02	ND		ND	1.0		2.1	ND	3.4	53
Oct-95	115.08	N D	0.02	14 0	0.014	ND	0.005	<u> </u>	0.02	14 0	0.74		1.0		3.8		1.4	98
Jan-96	112.98	N D		ND	0.014	ND	0.005		0.073		1.0	.,,	4.2		4.9		10.0	85
Apr-96	116.39	N D		ND	0.01	ND	0.005	ND	0.02	ND	0.5		1.3		11.0		14.0	37
Jul-96		ND		ND	0.01	ND	0.005		0.02	.,,		ND	1.0		1.6		2.7	87
Oct-96	112.17	N D	0.01	ND	0.01	ND	0.005	11.5	0.036		0.96		1.0		1.4		1.5	150
Jan-97	113.76	ND		ND	0.01	ND	0.005	\vdash	0.029	ND		ND	1.0		1.7		2.8	95
Apr-97	116.62	ND		ND	0.01	ND	0.005	ND	0.02	ND	0.5		1.1		1.2	ND	1.0	63
Jul-97	116.74	ND	_	ND	0.01	ND	0.005		0.02		0.56	ND	1.0	ND	1.0	ND	1.0	54
Oct-97	111,27	ND	0.02	ND	0.01	ND	0.005	<u> </u>	0.025	ND	0.5		1.0		1.0	ND	1.0	85
Jan-98	111.47	ND	0.02		0.01	ND	0.005	\vdash	0.044	ND	0.5		2.2		5.2		6.8	97
Apr-98	116.38	ND	0.02		0.01	ND	0.005	ND	0.02	ND		ND	1.0		1.6		1.8	23
Jul-98	117.62	ND		ND	0.01	ND	0.005	ND	0.02	ND	0.5			ND	1.0	ND	1.0	53
Oct-98	115.06	ND		ND	0.01	ND	0.005	<u> </u>	0.042	.,,	0.68	ND	1.0		1.0	ND	1.0	88
Jan-99	112.28	ND	_	ND	0.01		0.0056		0.05	ND	1.2	ND	2.5		2.5	ND	2.5	160

					==								156		RGEAE	LE		1	
					MET		No design		0					MATICS			-		OCARBON
Monitor	Groundwater		avalent		Total	C	admium		Copper	l Re	nzene		Toluene	_ ا	Ethyl-		Total	1	loroethen
Well No. / Date	Elevation (Feet MSL)	Cn	romium	CI	hromium		/ma/L)		(ma/l)		((// \	l Re	nzene		Xylenes		//I \
	(Feet MSL)		(mg/L)		(mg/L)		(mg/L)		(mg/L)	<u> </u>	(ug/L)		(ug/L)		(ug/L)		(ug/L)	<u> </u>	(ug/L)
MW-9	05.55		0.45		0.00	11.5	0.000	115	0.000	115	0.5		0.5	115	0.5			├	
Jan-89 Apr-89	95.55 99.67	NI D	0.45 0.02		0.33	N D	0.003	N D N D	0.009	_	0.5	N D		N D N D	0.5 1.0	N D	1.0		55
Jul-89	98.77	ND	0.02		0.08	ND	0.01	ND	0.02	ND	0.7	ND		ND	1.0	ND	1.0 1.0	_	24 57
Oct-89	95.62	NU	2.5		1.8	ND		ΝD	0.02		0.5	ND		ND	1.0	ND	1.0		110
Jan-90	96.44		2.28		2.2	ND	0.01	ND	0.02	ND	2.5	ND	2.5	N D	2.5	ND	5.0		100
Apr-90	98.26		0.8		0.81	ND	0.005		0.02	ND	2.5	ND	2.5		2.5	ND	5.0		150
Jul-90	99.78		0.03		0.04	ND	0.003	ND	0.02	ND	2.5	ND	2.5		2.5	ND	5.0		64
Oct-90	98.69		0.25		0.19	ND	0.005	11.5	0.062	ND	0.5	ND	1.0		1.0	ND	1.0		17
Jan-91	98.04		0.124		0.085	ND	0.005	ND	0.02	ND	0.5	.,,	6.6	''' -	1.4	110	9.0		26
Apr-91	100.83	ND	0.02	ND	0.01	ND	0.005	ND	0.02	ND	0.5	ND		ND	1.0	ΝD	1.0	-	26
Jul-91	101.88	ND	0.02		0.027	ND	0.005	ND	0.02		0.5	ND	1.0	11.5	99.0	ND	1.0		41
Oct-91	101.30		0.05		0.07	ND	0.005	ND	0.01		0.5	ND	1.0		94.0	ND	1.0		120
Jan-92	103.62	ND	0.05	ND	0.0081	ND	0.0027		0.031	ND	1	ND	1.0	1	1220.0		92.0		45
Apr-92	106.27	ND	0.02	ND	0.01	ND	0.005	ΝD	0.02	ND	0.05		2800.0		3600.0		6190.0		52
Jul-92	106.93	ND	0.02	ND	0.01	ND	0.005	ND	0.02	ND	0.05		34000.0	7	7900.0		24000.0	ND	1000
Oct-92	104.3	N D	0.02	ND	0.01	ND	0.005		0.02		1000		83000.0		3000.0		58000.0		1000
Jan-93	107.56	ND	0.02		0.057	ND	0.005		0.053	ND	50		400.0	3	3900.0		5300.0	ND	100
Apr-93	115.26	ND	0.02	ND	0.01	ND	0.005	ND	0.02	ND	50		5100.0	4	1000.0		9200.0		110
Jul-93	115.81	ND	0.02	ND	0.01	ND	0.005	ND	0.02	ND	16	ND	33.0		160.0		74.0		1100
Oct-93	115.79	ND	0.02	ND	0.01	ND	0.005	ND	0.02	ND	2.5	ND	5.0		120.0		45.0		390
Jan-94	115.76	ND	0.02	ΝD	0.01	ND	0.005	ND	0.02	ND	10		48.0		290.0		220.0		230
Apr-94	116.51	ND	0.02	ND	0.01	ND	0.005	N D	0.02	ND	500		17000.0	12	2000.0		32000.0		270
Jul-94	117.03	ND	0.02	ND	0.01	ND	0.005	_	0.02	ND	1000		56000.0		5000.0		10000.0		200
Oct-94	111.17	ND	0.02	ND	0.01	ND	0.005	N D	0.02	ND	500		57000.0	11	0.000	;	34000.0		350
Jan-95	112.25	ND	0.02	ND	0.01	ND	0.005	N D	0.02	ND	250		8200.0	9	0.008		2000.0		310
Apr-95	117.92	ND	0.02	ND	0.01	ND	0.005		0.02			ND	100.0		650.0		480.0		670
Jul-95	119.31	ND	0.02	N D	0.01	ND	0.005		0.02		10		69.0		780.0		340.0		540
Oct-95	115.67	N D	0.02	ND	0.01	ND	0.005		0.02		25		110.0		670.0		1900.0		320
Jan-96	113.73	ND	0.02	ND	0.01	ND	0.005		0.02	ND	50		100.0	4	1300.0		6100.0		500
Apr-96	117.00	ND	0.02	N D	0.01	N D	0.005		0.02		3.3		5.5		24.0		22.0		580
Jul-96	116.49	N D	0.01	ND	0.01	ND	0.005		0.02		4.6	ND	2.0		42.0		4.3		570
Oct-96	112.73	N D	0.01	N D	0.01	ND	0.005		0.02	_	50	ND	100.0		2900.0		350.0	<u> </u>	470
Jan-97	114.46	N D	0.02	ND	0.01	ND	0.005		0.02	ND		ND		ND	5.0	ND	5.0	<u> </u>	400
Apr-97	117.29	N D	0.02	ND	0.01	N D	0.005		0.02	ND	5	ND	10.0		18.0	ND	10.0		770
Jul-97	117.34	N D	0.02	ND	0.01	ND	0.005		0.02		25	ND	50.0		2500.0		860.0	_	850
Oct-97	113.75	N D	0.02		0.048	N D	0.005		0.02	ND	25	41.5	150.0	1	900.0		4800.0		50
Jan-98		N D	0.02	ND	0.01	N D	0.005		0.02		5	ND	10.0		690.0		260.0		270
Apr-98	117.07	N D	0.02	ND	0.01	ND	0.005		0.02		5	ND	10.0		23.0	ND	10.0		390
Jul-98	118.26	ND	0.02	N D	0.01	ND	0.005	ND	0.02	ND	12	ND	25.0		73.0	ND	25.0		1300
Oct-98	115.49		3.3	11.5	1.3	AL D	0.0075	N. D.	0.34	NIC	7.4	ND	12.0		390.0	ND	12.0	├	1200
Jan-99	112.68		3.3	ND	0.01	N D	0.005	עעו	0.02	ND	6.2	ND	12.0	L	100.0		83.0	L	_550

														PUP	GEAB	LE			
					MET									MATICS					OCARBONS
Monitor	Groundwater	Hexav			Total	C	admium		Copper	Bei	nzene		Toluene		Ethyl-		Total	Tric	hloroethene
Well	Elevation	Chro		Cł	romium				, ,,		, ,,	ŀ	, ,		nzene		Xylenes		
No. / Date	(Feet MSL)	(r	mg/L)		(mg/L)		(mg/L)		(mg/L)		(ug/L)		(ug/L)		(ug/L)		(ug/L)	<u> </u>	(ug/L)
MW - 11														<u> </u>	-12.2				
Jan-89	95.97	N D	0.01	ND	0.014	ND	0.003	ND	0.009	ND	0.5	ND	0.5	ļ <u> </u>	43.0		1.5 11000.0		34
Apr-89	99.85	N D	0.02	115	0.04	ND	0.01	ND	0.02	ND	500	115	7500.0		600.0				39
Jul-89	98.95	N D	0.05	N D N D	0.02	N D	0.01	ND	0.13	N D	<u>7</u> 5	N D	10.0	ND	10.0 200.0	ND	90.0	\vdash	29 35
Oct-89	95.77 96.72	N D	0.05	ND	0.02	ND	0.01	ND	0.05	ND	<u>5</u>	ND	5.0	 	83.0	ND	10.0		46
Jan-90 Apr-90	98.72	N D	0.02	N D	0.01	ND	0.005	ND	0.02	ND	2.5	ND	2.6		370.0	ND	150.0	\vdash	33
Jul-90	100.00	N D	0.02	ND	0.01	ND	0.003	ND	0.02	ND	25		440.0		000.0		760.0	\vdash	65
Oct-90	98.97	N D	0.02	ND	0.01	ND	0.005	ND	0.02	ND	0.5		15000.0		0.000		10000.0	ND	
Jan-91	98.29	ND	0.02	ND	0.01	ND	0.005	ND	0.02	ND	0.5	\vdash	15000.0		700.0		12000.0		
Apr-91	101.17	ND		ND	0.01	ND	0.005	ND	0.02	ND	0.5		8500.0		300.0		7500.0		63
Jul-91	102.19	ND		ND	0.01	ND	0.005	ND	0.02	ND	0.5		57.0		520.0		220.0		61
Oct-91	101.61	ND	0.02	ND	0.01	ND	0.005	ND	0.01	ND	0.5		140.0		0.000		660.0		110
Jan-92	104.09		0.10	ND	0.0081	ND	0.0027		0.02	ND	1		7.3		230.0		26.0		85
Apr-92	106.61	ND	0.02	ND	0.01	ND	0.005	ND	0.01	ND	0.05		1.7		130.0		2.3		70
Jul-92	107.12	ND	0.02		0.02	ND	0.005		0.09	ND	0.05		0.1		17.0		0.1	$ldsymbol{ldsymbol{ldsymbol{eta}}}$	160
Oct-92	104.55	ND	0.02		0.011	ND	0.005	ΝD	0.01	ND	0.05	ND	0.1		11.0	ND	0.1		160
Jan-93	108.27	ND	0.02		0.013	ND	0.005		0.088	ND	1.2	ND	2.5	ļ	110.0	N D	2.5		86
Apr-93	115.6	ND	. 0.02	ND	0.01	ND	0.005		0.02	ND	0.05	ND	1.0		2.0	ND	1.0	<u> </u>	59
Jul-93	116.07	N D	0.02	ND	0.01	ND	0.005		0.02	N D	0.05		2.5		1.8		6.4		230
Oct-93	116.01	ND	0.02	ND	0.01	ND	0.005		0.02	ND	0.5		1.0		2.1		3.1		150
Jan-94	116.03	N D	0.02	ND	0.01	N D	0.005		0.02	ND	0.5		1.0		2.5	ND	2.8		190
Apr-94	116.83		0.02	ND	0.01	ND	0.005		0.02		0.5		1.0	N D	1.0 1.0	ND	1.0 1.6	-	80 180
Jul-94	117.23 111.30	N D	0.02	ND	0.01	N D	0.005		0.02		0.5 0.5		1.0	IND	4.5	ND	1.0	⊢	360
Oct-94 Jan-95	112.53	N D	0.02	ND	0.011	ND	0.005		0.02	ND	10	IND	660.0		850.0	ND	1100.0	-	660
Apr-95	118.26	ND		ND	0.01	ND	0.005		0.02			ΝD	100.0		900.0		1000.0		74
Jul-95	119.51	ND	0.02	ND	0.01	ND	0.005		0.02	ND	2.5		5.0	 	160.0		37.0	-	140
Oct-95	115.80	N D	0.02	ND	0.01	ND	0.005		0.02	_	0.5		1.0	 	5.8		2.2		180
Jan-96	113.98	ND		ND	0.01	ND	0.005	_	0.02	ND	25		520.0		460.0		1000.0		620
Apr-96	117.37	ND	0.02	ND	0.01	ND	0.005		0.023		25		160.0	1	100.0		1400.0		240
Jul-96	116.75	ND	0.01		0.01	ND	0.005	ND	0.02		10	ND	20.0		460.0		290.0		220
Oct-96	112.95	ND	0.01	ND	0.01	ND	0.005	ND	0.02	ND	0.5		1.9		20.0		8.0		250
Jan-97	114.78	ND	0.02	ND	0.01	ND	0.005		0.029	ND	0.5		9.4		84.0		88.0		160_
Apr-97	117.60	ND	0.02	ND	0.01	ND	0.005	ND	0.02	ND	2.5		5.0		120.0		8.2	-	370
Jul-97	117.61	ND	0.02	ND	0.01	ND	0.005		0.15		2.5		5.0		8.3	ND	5.0		240
Oct-97	114.02	ND	0.02	ND	0.01	ND	0.005		0.1	ND	2.5	ND	5.0		5.0	ND	5.0		350
Jan-98	112.23	ND	0.02	ND	0.01	N D	0.005	ND	0.02	_	12	-	770,0	1	800.0		2200.0	_	390
Apr-98	117.36	N D	0.02	N	0.01	ND	0.005	<u> </u>	0.077	ND	1.2	L	63.0		150.0		210.0	┿	180
Jul-98	118.57	ND	0.02	ND	0.01	ND	0.005		0.077	ND	1.2		2.5	+	41.0	NIC	4.8	+	150
Oct-98	115.91	ND	0.02	ND	0.01	ND	0.005	AL D	0.041	ND	5	-	10.0	ND	10.0	ND	10.0	-	430
Jan-99	113.05	ND	0.02	ND	0.01	ND	0.005	ND	0.02	ND	6.2	L	260.0		750.0		970.0	<u> </u>	690

							<u> </u>				PURGEA	BLE		
·				MET	ALS					ARON	MATICS			HALOCARBONS
	Monitor	Groundwater	Hexavalent	Total	Cadmium	Copper	Bei	nzene		Toluene	Ethyl-		Total	Trichloroethene
	Well	Elevation	Chromium	Chromium							Benzene	1 :	Xylenes	
	No. / Date	(Feet MSL)	(mg/L)	(mg/L)	(mg/L)	(mg/L)		(ug/L)		(ug/L)	(ug/L)		(ug/L)	(ug/L)
	MW - 14S													
	Oct-90	98.07	3.2	2.2	0.018	5.3	ND	0.5	ND	1.0	1750.0	ND	1.0	180
	Jan-91	97.38	0.4	0.94	0.007	1	ND	0.5	ND	1.0	2800.0		5900.0	108
	Apr-91	99.26	0.39	0.41	0.005	0.15			ND	1.0	4100.0	ND	1.0	84
	Jul-91	101.27	0.02	0.31	0.005	0.11	ND	0.5	ND	1.0	31.0	ND	1.0	55
	Oct-91	100.66	0.13	0.23		0.05	ND		ND	1.0	680.0	ND	1.0	81
	Jan-92	103.08	0.27	0.15		0.093			ND			ND	1.0	59
	Apr-92	105.70	0.13	0.16			ND		ND		ND 0.5		0.5	56
	Jul-92	106.38	0.1	0.33					ND		ND 1.0		1.0	44
	Oct-92	103.72	0.16	0.54					ND		N D 1.0		1.0	71
	Jan-93	107.00	0.056	0.24				0.5	N D		N D 1.0	ND	1.0	56
	Apr-93	114.80		0.018		0.032	ND	0.5		24.0	40.0		55.0	18
	Jul-93	115.36		0.20		0.023		0.5		1.3	1.2		3.8	25
	Oct-93		N D 0.02	0.01			ND	0.5		1.0	2.1		3.7	25
_	Jan-94		N D 0.02	0.015			ND	0.5	ND	1.0	3.2		1.4	21
	Apr-94	116.06		0.022				0.5	ND	1.0			1.0	29
	Jul-94	116.64	N D 0.02	0.016			ND	0.5	ND	1.0	ND 1.0		1.0	15
	Oct-94	110.70	0.035	0.064				0.53	ND	1.0	ND 1.0		1.0	58
ضد	Feb-95	113.10		0.016		0.020		50	ND	100.0	3000.0		690.0	50
	Apr-95	117.50		N D 0.01			_	5		76.0	120.0		190.0	20
	Jul-95	118.93	N D 0.02	ND 0.01	0.0055			0.5		2.8	26.0		12.0	22
	Oct-95	115.25	0.022	0.046				0.5	ND	1.0	2.1		2.0	35
	Jan-96	113.13		0.034		0.024	ND	1		4.7	87.0		58.0	42
	Apr-96	116.52	0.021	0.028			ND	2.5		54.0	120.0		110.0	51
	Jul-96	116.04	ND 0.01	0.069				0.58		1.0	20.0		10.0	37
	Oct-96	112.22	0.052	0.082				0.5	ND	1.0	13.0		2.9	61
	Jan-97	113.85	0.024	0.031			ND	2.5	ND	5.0	470.0		5.0	90
	Apr-97	116.82	N D 0.02	0.032	0.0053			0.58		2.9	91.0		36.0	45
	Jul-97	117.21	N D 0.02	0.016			ND	5	ND	1.0	14.0		1.0	35
	Oct-97	113.39	0.1	0.013			ND	0.5	ND	1.0	20.0		1.8	57
	Jan-98	111.43	* N D/0.0103	0.018		0.020	ND	0.5		1,1	19.0		5.0	50
_	Apr-98		N D 0.02	0.018			ND	12	ND	25.0	1500.0		150.0	38
	Jul-98	117.79		ND 0.01				0.51	ND	1.0	18.0		8.4	18
	Oct-98	115.19	0.032	0.044		0.027	ND	1.2	ND	2.5	120.0	_	29.0	62
	Jan-99	112.31	0.058	0.032	ND 0.005	ND 0.020		1.1	ND	2.0	77.0		64.0	98

^{*} ND/10.3 = EPA method 7196/EPA Method 218.6 (Sample was analyzed for hexavalent chromium by two methods.)

															Pl	JRGEAB	LE			
i						MET	ALS							ARON	ATIC	S			HALOCARB	ONS
	Monitor	Groundwater	Hexa	valent		Total	C	admium		Copper	Be	nzene		Toluene		Ethyl-		Total	Trichloroeth	ene
	Well	Elevation	Chro	mium	Ch	romium									В	enzene)	Kylenes		- 1
	No. / Date	(Feet MSL)	(mg/L)		(mg/L)		(mg/L)		(mg/L)		(ug/L)		(ug/L)		(ug/L)		(ug/L)	(ug/L)	
	MW - 15S																			
-	Oct-90	97.71	ND	0.02	ND	0.01	ND	0.005	ND	0.02	ND	0.5	ND	1.0	ND	1.0	ND	1.0	21	
	Jan-91	97.10	ND	0.02	ND	0.01	ND	0.005	ND	0.02	ND	0.5		4.0		1.6		4.0	13	
	Apr-91	99.71	ND	0.02	ND	0.01		0.011	ND	0.02	ND	0.5	ND	1.0	N	1.0	ND	1.0	28	
	Jul-91	100.94	ND	0.02	ND	0.01		0.014	ND	0.02	ND	0.5	ND	1.0	D	1.0	ND	1.0	17	
-	Oct-91	100.35		0.02		0.01		0.02			ΝD	0.5	ND		ND	1.0	N D	1.0	13	
	Jan-92	102.72			ND	0.0081		0.008		0.01	ND	1	ND	1.0	ND	1.0	ND	1.0	15	
	Apr-92	105.29	ND		N D	0.01	N D	0.005	N D	0.01	ΝD		ND	0.5	N	0.5	ND	0.5	4.1	
	Jul-92	105.95	ND	0.02		0.04		0.005		0.27	N D		ND	0.5	ND	0.5	ND	0.5	2.9	
***	Oct-92	103.37	ND		ND	0.02		0.0073		0.047	ND		ND	0.5	ND	0.5	ND	0.5	ND 1	
	Jan-93	106.58		0.02		0.014		0.0085		0.1	ND		ND		ND	1.0	ND	1.0	9.0	
	Apr-93	114.41	N D	0.02		0.013		0.005	N D	0.02	ND	0.5		14.0		10.0		22.0	4.6	
	Jul-93	115.01	ND	0.02		0.01		0.005	N D	0.02	ND	0.5			ND	1.0		2.4	2.4	
-	Oct-93		ND	0.04		0.01		0.005	ND	0.02	ND		ND	1.0	ΝD	1.0	ND	1.0	3.2	
	Jan-94	114.90			ND	0.01		0.005	ND	0.02	ND		ND	1.0	ND	1.0	ND	1.0	1.9	
	Apr-94	115.72	ND	0.02		0.01		0.005	ND	0.02			ND		ND	1.0	N D	1.0	3.1	
	Jul-94	116.31	ND		ND	0.01		0.005	ND		ND		ND	1.0	ND	1.0	ND	1.0	2.1	
-	Oct-94	110.42	N D		ND	0.01		0.005	ND	0.02	ND		ND	1.0	ND	1.0	N D	1.0	6.0	
_	Jan-95	111.14		0.048		0.044		0.005	ND	0.02	N D	1		4.0		64.0		27.0	3.7	
	Apr-95	117.15		0.02		0.01		0.005	ND	0.02	ND	2.5		60.0		82.0	-	130.0	2.8	
	Jul-95	118.61	ND		ND	0.01		0.005	ND	0.02	ND	0.5		2.5		18.0		12.0	5.2	
	Oct-95	114.45	ND		N D	0.01			ND	0.02	ND		ND	1.0		1.0	N D	1.0	3.9	
-	Jan-96	112.69		0.02		0.012		0.005	ND	0.02	ND	0.5		1.8		25.0		22.0	3.8	
	Apr-96	116.09		0.02		0.015		0.005	ND	0.02	ND	0.5		13.0		40.0		45.0	2.8	
	Jul-96	115.69		0.01		0.014		0.005	ND	0.02	ND		ND	1.0		9.7	***	5.4	3.2	
	Oct-96	111.81	N D	0.01	ND	0.01		0.005	ND	0.02	ND		ND	1.0		2.9		2.6	5.3	
-	Jan-97	113.42	N D	0.02		0.01		0.005	ND		ND	0.5		5.5		69.0		1.0	5.1	
	Apr-97	116.35	N D	0.02		0.01		0.005	ND	0.02		0.5		9.3		21.0		8.5	3.3	
	Jul-97	116.60		0.02		0.01		0.005	ND	0.02	ND	0.5	ND	1.0		8.2		1.3	4.1	-
	Oct-97	113.08		0.02		0.01		0.005	ND	0.02	N D	0.5	_	1.0		17.0		1.7	5.2	\dashv
-	Jan-98	111.06	* N D/0.0			0.021		0.005	N D	0.02	N D	0.5	ND	1.0		12.0		3.7	5.0	
	Apr-98	116.05	N D	0.02	ND	0.01		0.005	N D	0.02	ND	0.5	ND	1.0		60.0		7.2	3.1	
	Jul-98	117.47	N D	0.02		0.014		0.005	ND	0.02	ND	0.5		1.0		10.0		2.9	3.4	
	Oct-98	114.87	ND	0.02		0.017		0.005	ND	0.02	ND	0.5	ND	1.0		45.0		12.0	3.9	
	Jan-99	111.98		0.024	ND	0.01	N D	0.005	ND	0.02	ND	0.5	ND	1.0		19.0		2.2	7.0	

^{*} ND/0.0177 = EPA method 7196/EPA Method 218.6 (Sample was analyzed for hexavalent chromium by two methods.)

													PL	IRGEAB	LE		
سند				MET	ALS							ARON	ATIC	S			HALOCARBONS
	Monitor	Groundwater	Hexavalent	Total	C	admium		Copper	Bei	nzene		Toluene		Ethyl-		Total	Trichloroethene
	Well	Elevation	Chromium	Chromium									В	enzene		Xylenes	
	No. / Date	(Feet MSL)	(mg/L)	(mg/L)		(mg/L)		(mg/L)		(ug/L)		(ug/L)		(ug/L)		(ug/L)	(ug/L)
	MW - 16																
	Apr-92	105.99	N D 0.02	ND 0.01	ND	0.005	ND	0.01	ND	0.5		0.7		1.0		1.6	52
	Jul-92	106.7	N D 0.02	0.03	ND	0.02		0.35	ND	0.5	D	1.0	ND	1.0	ND	1.0	35
	Oct-92	104.07	N D 0.02	0.011	N D	0.005		0.15	ND	0.5	ND	1.0	ND	1.0	ND	1.0	72
	Jan-93	107.3	N D 0.02	N D 0.01	N D	0.005		0.44	ND	1.2	ND	2.5	ND	2.5	ND	2.5	51
_	Apr-93	114.9	ND 0.02			0.005	ND	0.02	ΝD	25		55.0		2300.0		1200.0	42
	Jul-93	115.54	ND 0.02	ND 0.01	N D	0.005	ND	0.02	ND		ND	100.0		3100.0		2000.0	15
	Oct-93	115.51	N D 0.04	ND 0.01	ND	0.005	ND	0.02	ND	5.0	ND	10.0		340.0	ND	10.0	24
	Jan-94	115.46	N D 0.02	ND 0.01	N D	0.005	D	0.02	N D	0.02	ND	20.0		1000.0	ND	20.0	22
-	Apr-94	116.25	N D 0.02	N D 0.01	ND	0.005	D	0.02	ND	10	ND	20.0		820.0	ND	20.0	37
	Jul-94	116.78	N D 0.02	ND 0.01	ND	0.005	D	0.02	ND		ND	50.0		1300.0		730.0	76
	Oct-94	111.02		N D 0.01	ND	0.005	D	0.02	ND	0.5		1.5		2.4		9.7	91
	Jan-95	112.08	N D 0.02	ND 0.01	N D	0.005	D	0.02	N D	0.5	ND	1.0	ND	1.0	ND	1.0	17
تسن	Apr-95	117.60	N D 0.02	N D 0.01	N D	0.005	ND	0.02	ND	5		16.0		36.0		55.0	34
	Jul-95	118.99	N D 0.02	N D 0.01	ND	0.005	D	0.02	ND	10	ND	20.0	* 54	0/370	ND	20.0	67
	Oct-95	115.45	N D 0.02			0.005	ND	0.02	ND	0.5	ND	1.0		1.8		1.3	60
	Jan-96	113.49	ND 0.02	ND 0.01	N D	0.005	D	0.02	ND	0.5	ND	1.0		11.0		9.7	26
-	Apr-96	116.72	N D 0.02	N D 0.01	N D	0.005	ND	0.02	ND	0.5		9.8		30.0		33.0	36
	Jul-96	116.24	N D 0.01	ND 0.01	N D	0.005	ND	0.02	ND	0.5	ND	1.0		6.6		3.6	110
	Oct-96	112.59	N D 0.01	N D 0.01		0.005	ND	0.02	ND	5		49.0		130.0		230.0	73
	Jan-97	114.18	N D 0.02	N D 0.01	N D	0.005	ND	0.02		1		4.6		23.0	ND	2.0	32
, inch	Apr-97	117.01	N D 0.02	N D 0.01	ND	0.005	ND	0.02			ND	2.0		7.2		2.4	31
_	Jul-97	117.12	ND 0.02	N D 0.01	N D	0.005	ND	0.02	ND	1.2		2.5		6.5	ND	2.5	30
	Oct-97	113.66		N D 0.01		0.005	N N	0.02	ND	2.5		5.0		8.2	ND	5.0	53
	Jan-98	111.92	N D 0.02	N D 0.01	ND	0.005	ND	0.02	ND	0.5		1.0		12.0	ND	3.8	29
	Apr-98	116.79		ND 0.01		0.005		0.023		0.5		1.0		28.0		2.7	29
-	Jul-98	118.00	N D 0.02	N D 0.01	N D	0.005		0.031	ND	0.5		1.0		6.0		1.8	28
	Oct-98	115.42	N D 0.02	N D 0.01	ND	0.005	ND	0.02	ND	2.5		5.0		16.0	ND	5.0	58
	Jan-99	112.68	N D 0.02	ND 0.01	ND	0.005	ND	0.02	ND	1.0	ND	2.0		11.0	ND	2.0	36

ND = Below detection limit as noted

MSL = Mean Sea Level
540/370 = original sample/duplicate sample (both results presented because duplicate result deviation is >20%)

TABLE 6-2 PHIBRO-TECH, INC.

January 1999 Quarterly Monitoring Well Sampling Purgeable Halogenated Organic Analytical Results (µg/L)

Well Identification	Tetrachloro- ethene (PCE)	Trichloro- ethene (TCE)	1,1-Dichloro- ethene (1,1-DCE)	1,1-Dichloro- ethane (1,1-DCA)	1,2-Dichloro- ethane (1,2-DCA)	Carbon Tetrachloride (CCL4)	Chloroform (CHCL3)	trans- 1,2-Dichloro- ethene (trans-1,2-DCE)	Methylene Chloride (CH2CL2)
PTI- MW01S	1.9	10	ND <1.0	1.2	1.5	ND <1.0	ND <1.0	ND <1.0	ND <1.0
PTI- MW01D	ND <1.0	2.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0
PTI- MW03	1.9	26	3.9	2.4	ND <1.0	23	16	ND <1.0	ND <1.0
PTI- MW04	ND <10	260	60	140	33	ND <10	35	ND <10	140
PTI- MW04A	ND <1.0	10	1.5	7.3	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0
PTI- MW06B	1.2	17	ND <1.0	1.3	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0
PTI- MW06D	ND <1.0	7.1	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0
PTI- MW07	ND <2.5	160	16	74	24	ND <2.5	3.0	5.3	ND <2.5
PTI- MW09	ND<12	550	100	490	230	ND <12	400	ND <12	940
PTI- MW11	ND <12	690	59	190	17	ND <12	26	ND <12	ND <12
PTI- MW14S	ND <2.0	98	21	27	5.6	31	23	ND <2.0	2.6
PTI- MW15S	1.1	7.0	ND <1.0	ND <1.0	1.7	4.4	4.4	ND <1.0	ND <1.0
PTI- MW15D	1.0	5.4	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0	ND <1.0
PTI- MW16	ND <2.0	36	17	170	41	ND <2.0	ND <2.0	4.6	ND <2.0
MCL	5.0	5.0	6.0	5.0	0.5	0.5	_	10	_
SGV GW	ND-4.8	ND-1.2	ND	ND	ND	ND	_	ND	

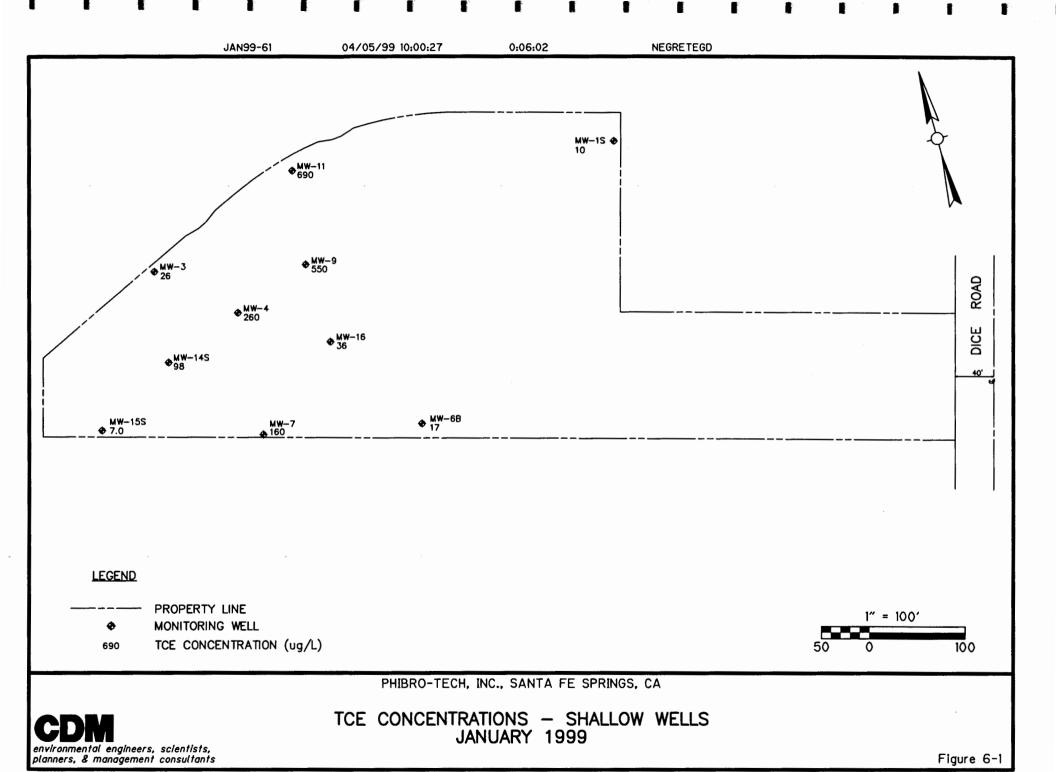
All analyses performed by EPA Method 8260.

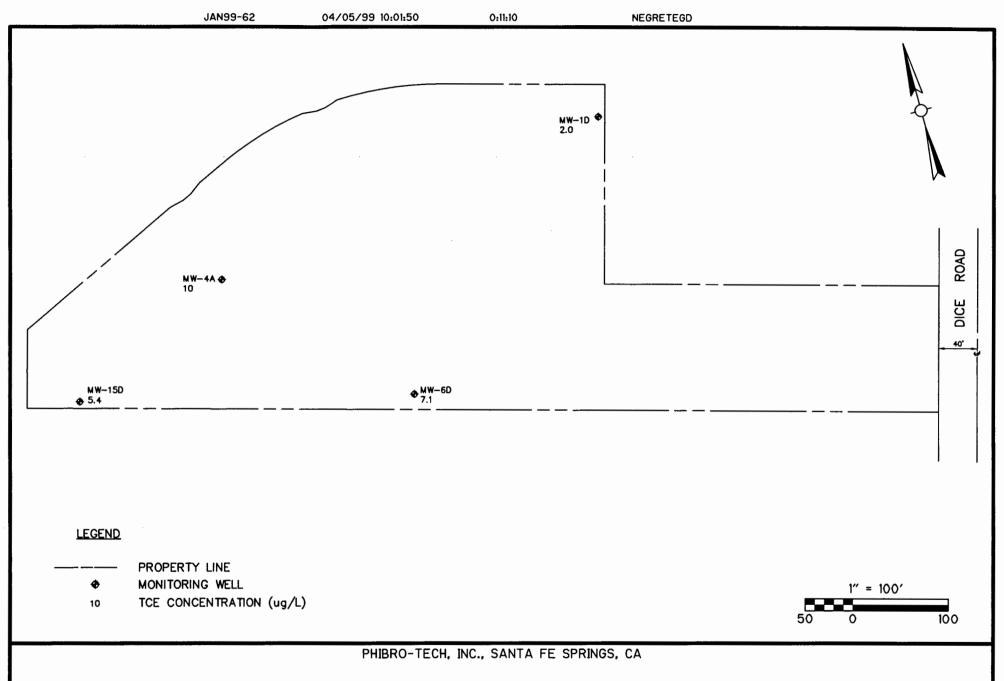
ND = Analytical parameter not detected

MW = Monitoring Well

MCL = Maximum Contaminant Limit

SGV GW = Range of concentrations in water supply wells tested in the Santa Fe Springs area during the year 1996.





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TCE CONCENTRATIONS — DEEP WELLS
JANUARY 1999

A review of the analytical results contained in Table 6-1 reveals that, with minor exceptions, TCE has historically been detected in all on-site monitoring wells, including the upgradient wells. Past discussions with Department of Health Services (now Cal EPA Department of Toxic Substances Control) and Regional Water Quality Control Board staff indicate that TCE is generally recognized as a regional groundwater contaminant.

Other Halogenated Organics

During the January 1999 sampling, other purgeable halocarbon compounds were detected in most of the on-site wells at concentrations ranging from $1.0\,\mu\text{g/L}$ tetrachloroethene (MW-15D) to 940 $\mu\text{g/L}$ methylene chloride (MW-09). The compounds 1,1- dichloroethane; chloroform; 1,1- dichloroethene; 1,2-dichloroethane; carbon tetrachloride; and trans-1,2-dichloroethene were also detected in several wells. Detections of these other chlorinated organic compounds are assumed to be related to the TCE plume.

6.2 Purgeable Aromatic Organic Compounds

According to PTI personnel, organic chemicals have not historically been used on-site in any of the production processes. Two 10,000 gallon underground storage tanks (diesel and gasoline), however, were located in the approximate center of the facility, due east of the drum wash area. During tank removal operations in July 1989, petroleum hydrocarbon contamination was discovered in the tank excavation. The RFI report indicated that petroleum hydrocarbon contamination was not detected at depths below 30 feet near the former tank locations. Although they have not been used on-site, purgeable aromatic compounds have been historically detected in groundwater underlying the facility. The primary organic compounds of concern are toluene, ethylbenzene and total xylenes, which vary in both concentration and lateral extent. The RFI report indicated that these compounds appeared to be migrating onto the subject property from the property to the north. According to Los Angeles County Department of Public Works files, leaks from tanks containing purgeable aromatic compounds with subsequent groundwater contamination are known to have occurred at the property to the north of PTI.

Purgeable aromatic compound results for January 1999 are presented in Table 6-3. Concentrations of total aromatic compounds for the shallow wells are illustrated on Figure 6-3. Historic sampling results indicate that purgeable aromatic contamination originated off-site to the north and has migrated onto the subject property. During previous sampling events, elevated concentrations of toluene, ethylbenzene and xylenes were detected in MW-11 and MW-3 along the northern perimeter of the property. Since approximately July 1991, elevated concentrations of these compounds have been detected in well MW-04, indicating that the plume may be migrating downgradient. In addition, since January 1992 high concentrations have also been detected in well MW-09. The results of the January 1999 sampling show that the highest concentrations of total purgeable aromatics (BTEX) were detected in MW-11 (Figure 6-3), which had an ethylbenzene concentration of 750 μ g/L and a total xylenes concentration of 970 μ g/L. The second highest total BTEX concentration was detected in well MW-04, which had a ethylbenzene concentration of 520 μ g/L.

TABLE 6-3 PHIBRO-TECH, INC.

January 1999 Quarterly Monitoring Well Sampling Purgeable Aromatic Organic Analytical Results (μg/L)

Well Identification	Benzene	Toluene	Ethylbenzene	Xylenes (Total)
PTI- MW01S	ND <0.50	ND <1.0	2.0	ND <1.0
PTI- MW01D	ND <0.50	ND <1.0	1.0	ND <1.0
PTI- MW03	ND <0.50	ND <1.0	2.3	ND <1.0
PTI- MW04	ND <5.0	ND< 10	520	31
PTI- MW04A	ND <0.50	ND <1.0	ND <1.0	ND <1.0
PTI- MW06B	ND <0.50	5.0	24	29
PTI- MW06D	ND <0.50	1.2	5.8	6.4
PTI- MW07	ND<1.2	ND <2.5	ND <2.5	ND <2.5
PTI- MW09	ND <6.2	ND <12	100	83
PTI- MW11	ND <6.2	260	750	970
PTI- MW14S	1.1	ND <2.0	77	64
PTI- MW15S	ND <0.5	ND <1.0	19	2.2
PTI- MW15D	ND <0.5	ND <1.0	15	2.1
PTI- MW16	ND <1.0	ND <2.0	11.0	ND <2.0
MCL	1	150	700	1,750
SGV GW	ND	ND	ND	ND

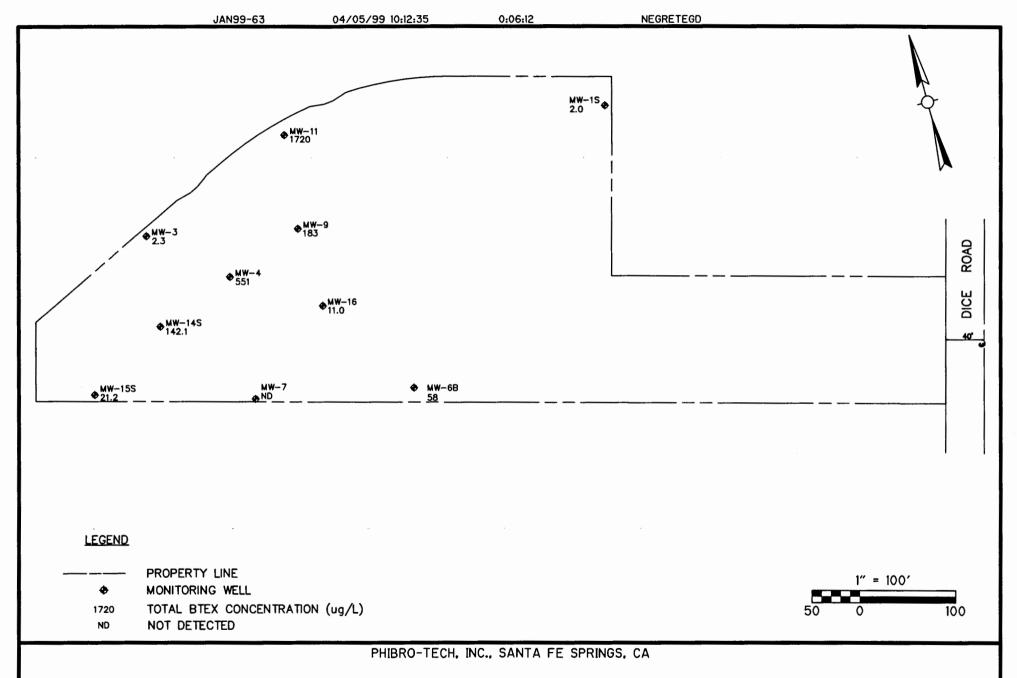
All analyses performed by EPA Method 8260.

ND = Analytical parameter not detected

MW = Monitoring Well

MCL = Maximum Contaminant Limit

SGV GW = Range of concentrations in water supply wells tested in the Santa Fe Springs area during the year 1996.



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TOTAL BTEX CONCENTRATIONS — SHALLOW WELLS JANUARY 1999

Benzene

During the January 1999 sampling, benzene was detected in only one well (MW-14S) at a concentration of 1.1 μ g/L. During the October 1998 sampling event, benzene was detected in two wells (MW-09 and MW-07) at a concentrations of 7.4 μ g/L and 0.68 μ g/L, respectively. Historical evidence indicates that benzene is not a contaminant of concern for the facility.

Toluene

During the January 1999 sampling event, toluene was detected in three wells (MW-06B, MW-06D, and MW-11) at a concentrations of $5.0~\mu g/L$, $1.2~\mu g/L$, and $260~\mu g/L$, respectively. Significant toluene concentrations were detected during July 1990 to July 1991 (MW-11), April 1991 to January 1992 (MW-04), April 1992 to April 1993 (MW-09), and April 1994 to January 1995 (MW-09). Concentrations were also detected at location MW-04 during January 1993. Elevated ethylbenzene and total xylene concentrations are generally associated with elevated toluene concentrations.

Ethylbenzene

During the January 1999 sampling round, ethylbenzene was detected in 12 of the 14 wells. Six wells had detections in the October 1998 sampling, all of which decreased in the January 1999 sampling. Well MW-11 had the highest concentration of 750 μ g/L, a significant increase from no detection reported in October 1998. Well MW-04 had the second highest concentration of 520 μ g/L, a decrease from 740 μ g/L detected in October 1998. Well MW-09 had the third highest concentration of 100 μ g/L, a decrease from 390 μ g/L detected in October 1998. The remaining wells with ethylbenzene detections had relatively low concentrations, ranging from 1.0 μ g/L in MW-01D to 77 μ g/L in MW-14S. Only wells MW-04A and MW-07 showed no detection of ethylbenzene in January 1999.

Total Xylenes

During the January 1999 sampling round, total xylenes were detected in 8 of the 14 wells. Six wells had detections in the October 1998 sampling, all of which decreased in the January 1999 sampling except for MW-14S, which increased to 64 μ g/L in January 1999 from 29 μ g/L in October 1998. The highest concentration of 970 μ g/L was detected in well MW-11, an increase from no detection reported in October 1998. The remaining wells with xylene detections had relatively low concentrations, ranging from 2.1 μ g/L in MW-15D to 83 μ g/L in MW-09.

6.3 Inorganic and Miscellaneous Parameters

Table 6-4 shows the analytical results for inorganic parameters (cadmium, total and hexavalent chromium, copper, and pH) during the January 1999 sampling event.

Hexavalent Chromium (Cr+6)

During the January 1999 sampling, hexavalent chromium was detected in five on-site wells. Well MW-04 had the highest concentration of 78.6 mg/L, an increase from the October 1998 result (34.1 mg/L). Concentrations of hexavalent chromium were also detected in wells MW-09 (3.3 mg/L), MW-14S (0.058 mg/L), MW-15S (0.024 mg/L) and MW-4A (0.020 mg/L). The hexavalent

chromium concentration increased from non-detection in October 1998 to 0.024 mg/L in MW-15S in January 1999, remained the same at 3.3 mg/L in MW-09, and decreased from 0.021 mg/L to 0.020 mg/L in MW-04A. Figure 6-4 shows the concentration of hexavalent chromium detected in the shallow wells during the January 1999 sampling.

The water purged from MW-04 has typically been bright yellow in color since CDM began sampling the wells on a quarterly basis in January 1989. During the January 1999 sampling round, the color of water from MW-04 was again noted as yellow and the color of the water from MW-09 was also noted as yellow. Figure 6-5 shows the concentrations of hexavalent chromium and groundwater elevations in MW-04 over time.

The concentrations of hexavalent chromium at MW-04 decreased from July 1989 (120 mg/L) to April 1993 (1.8 mg/L), while groundwater elevations increased. Since April 1993, hexavalent chromium concentrations have fluctuated up and down while groundwater elevations have remained fairly constant. Historically, hexavalent chromium has been detected in two wells other than MW-04, although the highest concentration has always been detected at MW-04. At MW-14S from October 1990 to January 1993, hexavalent chromium concentrations generally decreased, with analytical non-detections reported for the last six sampling rounds previous to October 1994 and eight of the last 14 sampling rounds since then. In MW-09, hexavalent chromium concentrations decreased between October 1989 and January 1991 and except for a trace amount detected in October 1991, hexavalent chromium concentrations have been below detection limits until the October 1998 sampling event. A trace level of hexavalent chromium was detected in MW-15S for the first time during the January 1995 sampling event.

Total Chromium (Cr[T])

Total chromium was detected above the detection limit in four monitoring wells during the January 1999 sampling event. The highest concentration was detected in well MW-04 at a concentration of 85.2 mg/L. The remaining wells with total chromium detections had relativley low concentrations ranging from 0.025 mg/L in MW-04A to 0.053 mg/L in MW-15D. Figure 6-6 shows the concentrations of total chromium detected in shallow monitoring wells during January 1999. Figure 6-7 shows the concentrations of total chromium and corresponding groundwater elevations in MW-04 over time.

Comparison of historical total chromium data with present data (Table 6-1) indicates that total chromium concentrations, like those of hexavalent chromium, generally decreased from January 1989 to April 1993, and have fluctuated up and down since April 1993. Historically, the highest total chromium concentrations have been detected in MW-04. Sporadic detections of total chromium close to the detection limit have occurred historically in nearly all shallow wells on site.

TABLE 6-4 PHIBRO-TECH, INC. January 1999 Quarterly Monitoring Well Sampling Inorganic Analytical Results (mg/L)

Well Identification	Cadmium	Chromium (Hexavalent)	Chromium (Total)	Copper	pН
	EPA- 6010-A	EPA- 7196	EPA- 6010-A	EPA- 6010-A	EPA- 9040
PTI- MW01S	ND < 0.0050	ND < 0.010	ND < 0.010	ND < 0.020	6.7
PTI- MW01D	ND < 0.0050	ND < 0.010	ND < 0.010	ND < 0.020	7.2
PTI- MW03	ND < 0.0050	ND < 0.020	ND < 0.010	ND < 0.020	7.2
PTI- MW04	0.58	78.6	85.2	ND < 0.040	6.4
PTI- MW04A	ND < 0.0050	0.020	0.025	ND < 0.020	7.8
PTI- MW06B	ND < 0.0050	ND < 0.020	ND < 0.010	ND < 0.020	7.2
PTI- MW06D	ND < 0.0050	ND < 0.020	ND < 0.010	ND < 0.020	7.5
PTI- MW07	0.0056	ND < 0.020	ND < 0.010	0.050	6.5
PTI- MW09	ND < 0.0050	3.3	ND < 0.010	ND < 0.020	6.3
PTI- MW11	ND < 0.0050	ND < 0.020	ND < 0.010	ND < 0.020	6.8
PTI- MW14S	ND < 0.0050	0.058	0.032	ND < 0.020	7.1
PTI- MW15S	ND < 0.0050	0.024	ND < 0.010	ND < 0.020	7.4
PTI- MW15D	ND < 0.0050	ND < 0.020	0.053	0.029	7.3
PTI- MW16	ND < 0.0050	ND < 0.020	ND < 0.010	ND < 0.020	6.8
MCL	0.005		0.05	1	
SGV GW	ND	ND	ND	ND-0.467	7.9-8.5

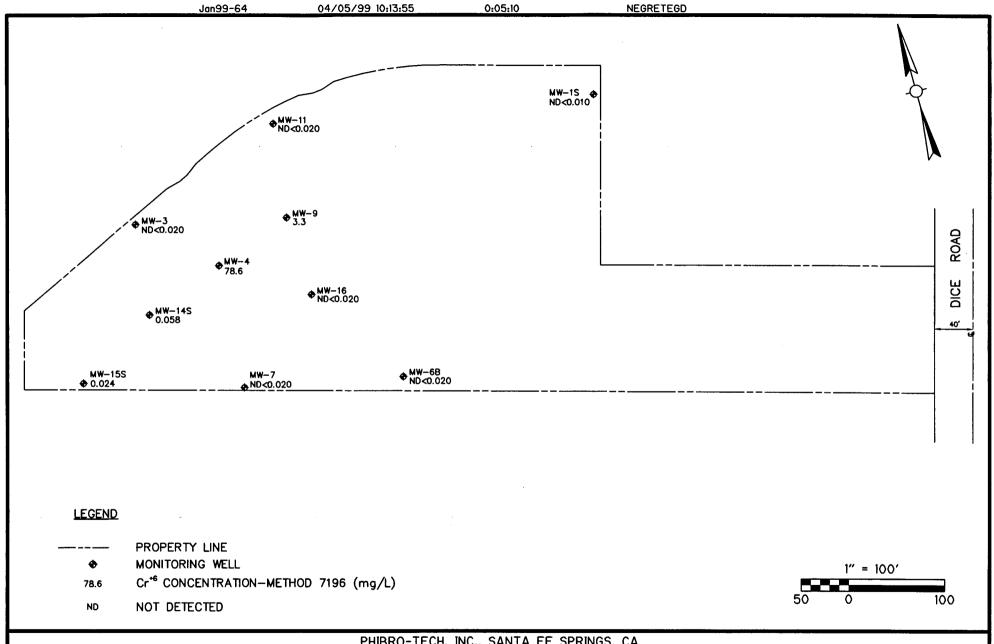
ND = Analytical parameter not detected.

NA = Parameter not analyzed

MW = Monitoring Well

MCL = Maximum Contaminant Limit

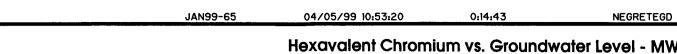
SGV GW = Range of concentrations in water supply wells tested in the Santa Fe Springs area in the year 1996.

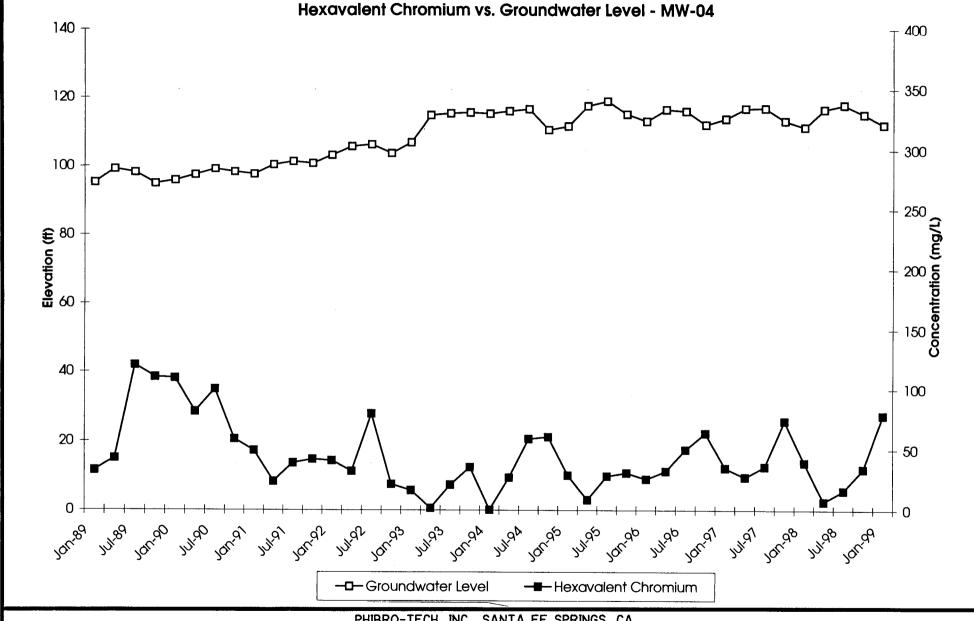


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HEXAVALENT CHROMIUM CONCENTRATIONS - SHALLOW WELLS JANUARY 1999

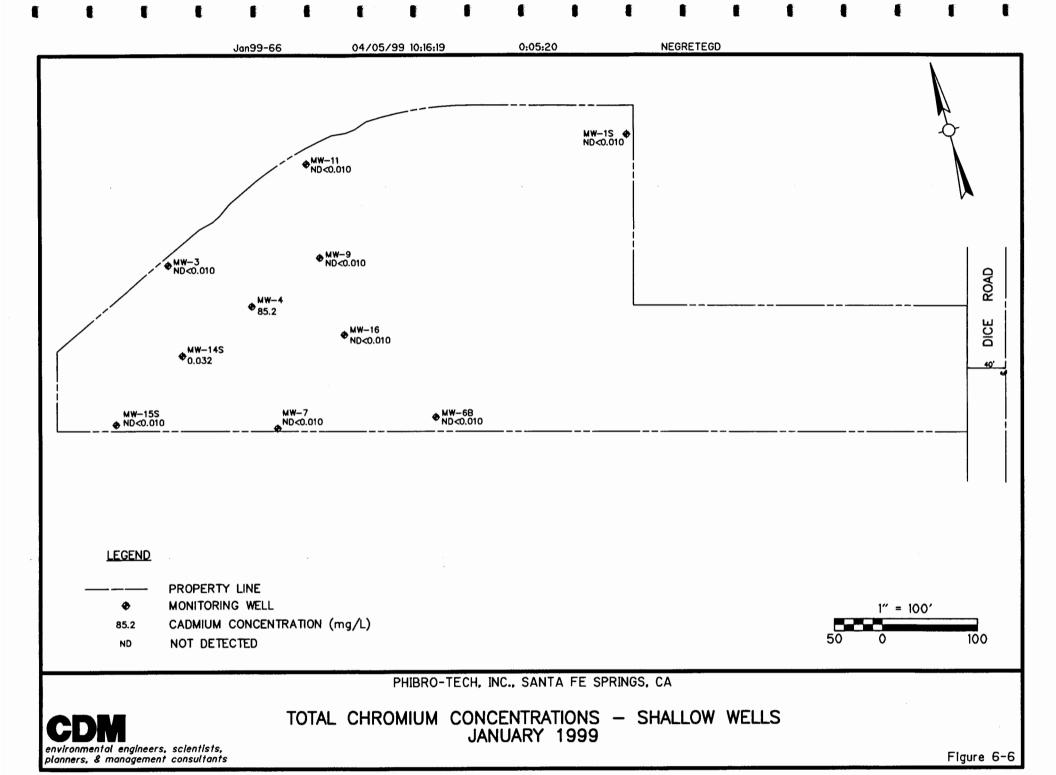


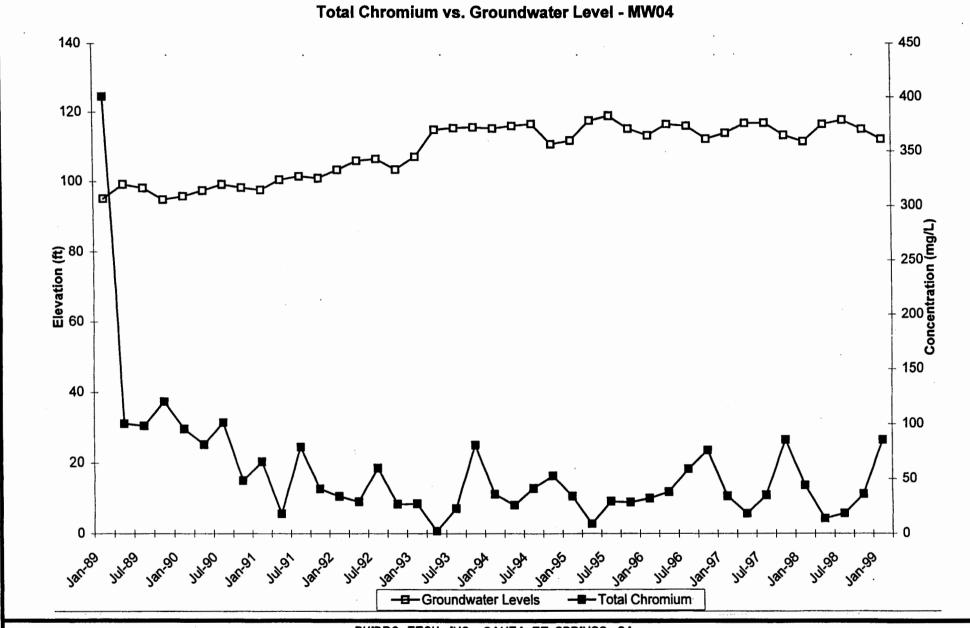


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HEXAVALENT CHROMUIM CONCENTRATIONS - GROUNDWATER ELEVATIONS MW-04 JANUARY 1989 - JANUARY 1999

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TOTAL CHROMUIM CONCENTRATIONS — GROUNDWATER ELEVATIONS

MW-04

JANUARY 1989 — JANUARY 1999

Cadmium (Cd)

During the January 1999 sampling event, cadmium was detected in two on-site wells at concentrations greater than the MCL of 0.005. Well MW-04 had a concentration of 0.58 mg/L, an increase from 0.44 mg/L in October 1998. Well MW-07 had a concentration of 0.0056 mg/L, an increase from no detection in this well in October 1998. Well MW-09 showed a concentration of 0.0075 mg/L in October 1998, but was not detected in January 1999.

Previous concentrations in MW-04 have ranged from 0.028 mg/L in January 1989 to 0.86 mg/L in July 1992. Figure 6-8 shows the cadmium concentrations detected in the on-site wells during January 1999. Figure 6-9 shows the concentrations of cadmium and corresponding groundwater elevations in MW-04 over time. As groundwater elevations have generally increased since January 1989, cadmium concentrations have also generally increased. As shown on the figure, cadmium concentrations have fluctuated considerably (i.e., from non-detectable at a detection limit of 0.005 mg/L during April 1993 to 0.86 mg/L during July 1992) since April 1990. Cadmium concentrations have consistently declined since January 1998 until the January 1999 sampling event when the concentration increased again.

Cadmium has been detected historically only in well MW-04, with the exceptions of 0.01 mg/L in MW-01 during July 1989, 0.005 to 0.018 mg/L in MW-14S during October 1990 through July 1991, 0.0055 mg/L in MW-14S during July 1995, and in MW-15S at low concentrations close to the detection limit from April 1991 to January 1993. Detected concentrations in MW-15S have ranged from 0.005 mg/L in July 1992 to 0.02 mg/L during October 1991.

Copper (Cu)

Copper was detected in two wells during the January 1999 sampling event, neither of which were above the MCL of 1.0 mg/L. Copper concentrations ranged from 0.050 mg/L in MW-07 to 0.029 mg/L in MW-15D. Figure 6-10 shows the copper concentrations detected in the on-site wells during January 1999. Historically, with the exception of well MW-14S, elevated concentrations of copper above the MCL have not been detected in on-site monitoring wells.

pН

Groundwater samples from all wells were measured for pH in the field during purging activities and also by the analytical laboratory on the samples submitted for analysis. Field pH measurements were recorded in the field log book during well purging. In January 1999, the field measurements of pH generally correlated with the values shown in Table 6-4, which range from 6.3 to 7.8.

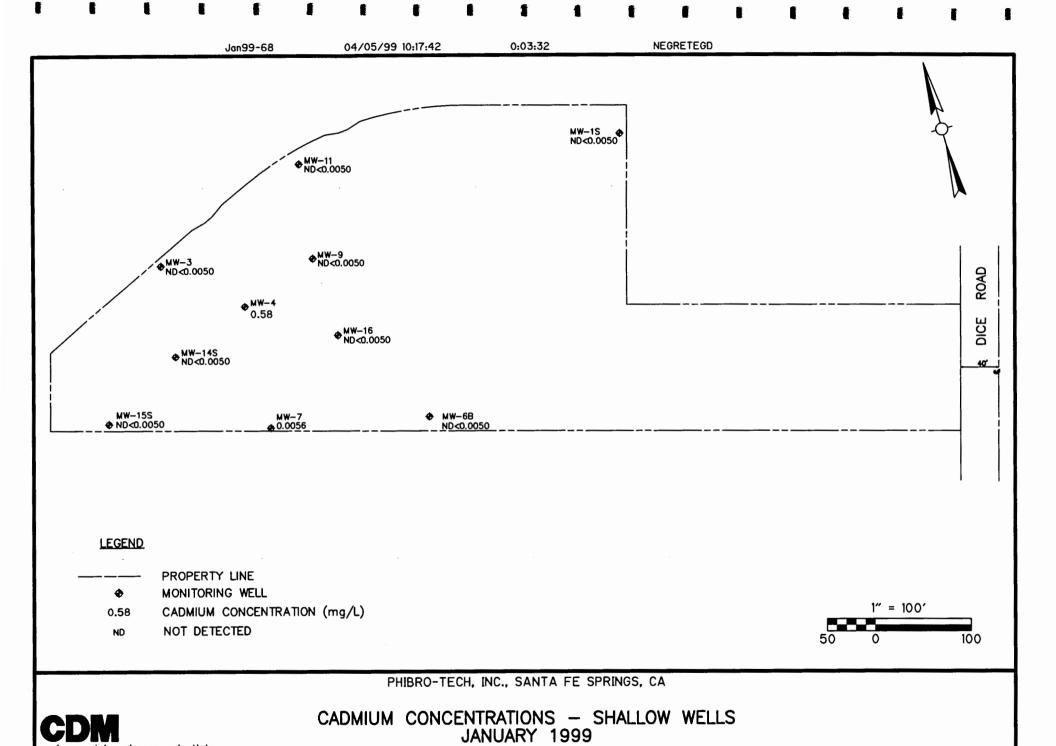
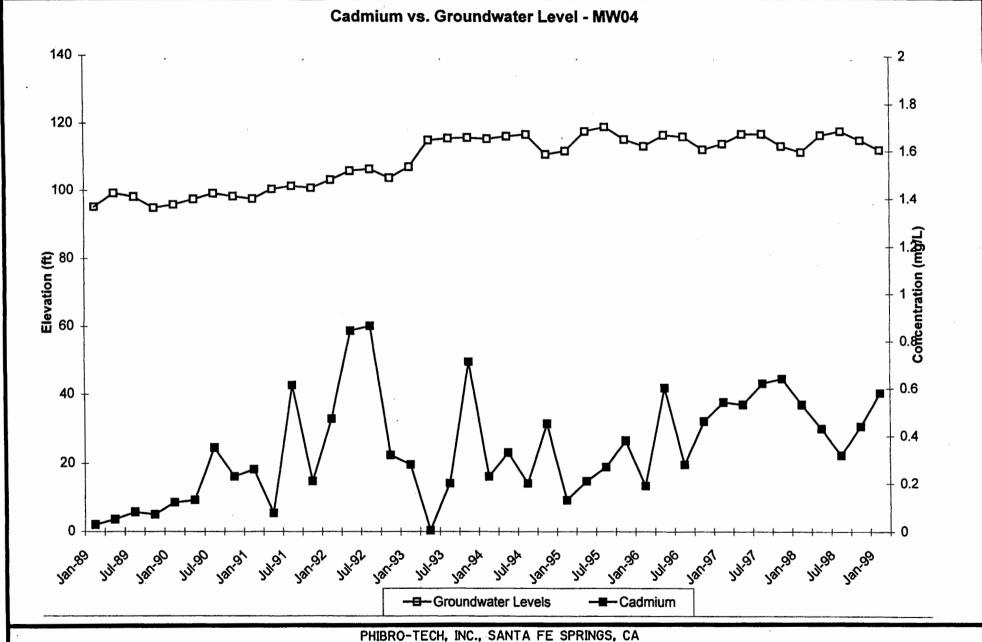


Figure 6-8

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CADMIUM CONCENTRATIONS - GROUNDWATER ELEVATIONS MW-04 JANUARY 1989 - JANUARY 1999

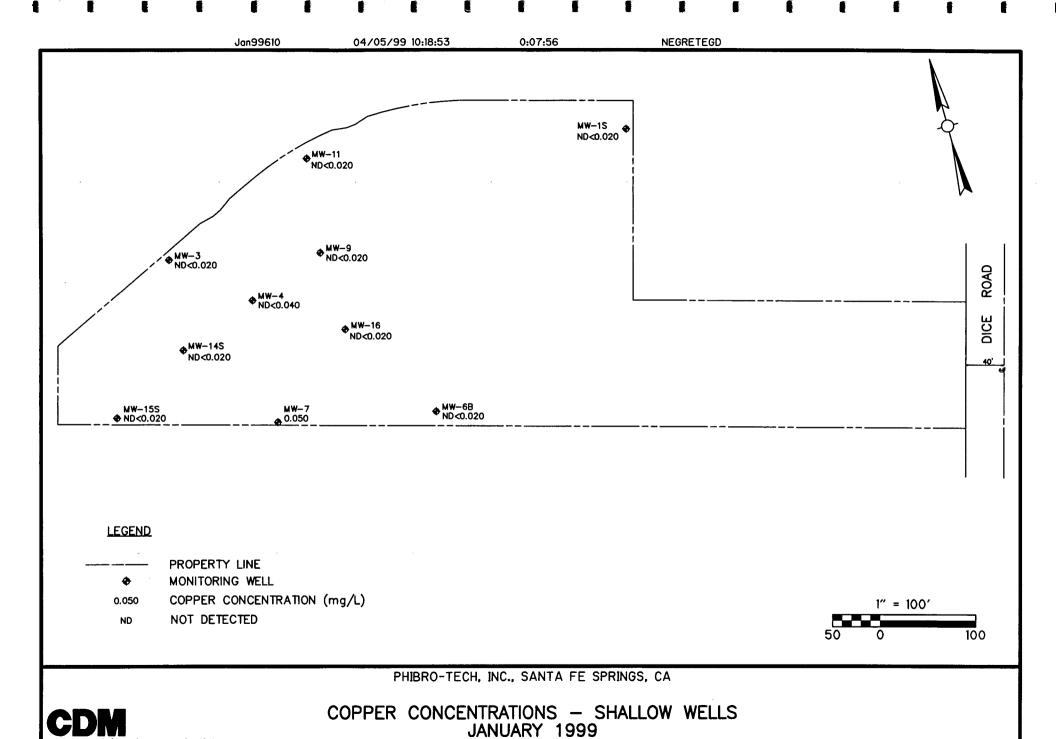


Figure 6-10

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Section 7 Statistical Evaluation

The following sections contain a statistical treatment of the monitoring data designed to determine if onsite wells have been impacted by metals, BTEX compounds (benzene, toluene, ethylbenzene, xylenes) or TCE (trichloroethene). The procedures used are based on the recommendations provided in the 1989 EPA Guidance document, *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities - Interim Final Guidance* and in the 1992 Addendum document. In some instances, methods which have not been recommended in the documents cited above were used. However, unrecommended techniques were only used to supplement the recommended procedures. When statistical methods outlined in the 1989 guidance document were superseded by the 1992 Addendum, the more recent recommendations were followed.

7.1 Determination of Background Upper Tolerance Limit

Overview

The upper tolerance limit (UTL) is a method that is typically used in compliance monitoring to compare downgradient wells to established maximum contaminant levels (MCLs) or alternate contaminant levels (ACLs). In short, the UTL represents the upper end of the tolerance interval, which is calculated at a specified confidence level and coverage. For instance, a UTL with 95 percent coverage and a 95 percent confidence level represents a value which, with 95 percent confidence, will be exceeded less than 5 percent of the time.

In the present evaluation, we have calculated UTLs for the background well (MW-1S) and compared this value to each individual downgradient analytical result using a confidence level and coverage of 95 percent. When onsite wells exceed the background UTL consistently, it suggests that a significant difference from background may exist. While this is not a recommended technique for detection monitoring, we have applied background UTLs as a screening tool and as a supplement to the more rigorous statistical comparisons that follow.

Methods

Inherent in the calculation of a parametric UTL is the assumption of a normal (or log normal) data distribution. One of the tests for normality recommended in the 1992 Addendum to the EPA guidance document is the probability plot. When a data set is normally distributed, the corresponding probability plot is linear. However, for the background well, the analyses have a high percentage of nondetects for most parameters. Therefore, the probability plots appear to be nonlinear (see Appendix E-3). Fortunately, several methods are available to adjust the mean and standard deviation (used in the calculation of the UTL) based on various treatment of nondetects that allow the use of a parametric UTL. In a parametric UTL, the magnitude of the analyses are considered, while in a nonparametric analysis, the data is ranked from highest to lowest and the UTL is calculated from the ranks. The choice of method depends on the percentage of nondetects in the population and on comparison of special probability plots designed to test the assumptions built into each model. Parametric methods for determination of the UTL are described below. When the percentage of nondetects is above 90 percent, the UTL is calculated using a nonparametric method employing the Poisson model. In the Poisson model, detected values are treated as "rare events,"

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such that the probability of occurrence is low, but constant. The model takes into account both the frequency of occurrence of detected values as well as the magnitude. Since the Poisson model is nonparametric, a normal or log normal data distribution is not required.

When the frequency of detect is greater than 10 percent and data are normally or log normally distributed, either the Atchison or Cohen adjustment is recommended. In the Atchison method, nondetects are assumed to equal zero, and therefore are not considered in the data distribution. In the Cohen adjustment, nondetects are assumed to have finite values between zero and the detection limit. Experience at EPA and USGS (EPA 1992) have shown that, in general, when the frequency of detect (FOD) is between 10 and 50 percent, Atchison's method is more valid; while between 50 and 90 percent FOD, Cohen's method is more valid. However, this is only a rule of thumb that should be verified periodically using the detects-only and censored probability plot method described above.

Results

The frequencies of detection for each parameter in the background well (MW-1S) is provided in Table 7-1. For hexavalent chromium, cadmium, and benzene, the FOD was less than 10 percent and the Poisson nonparametric method was used to calculate the UTL. Total chromium, copper, toluene, ethylbenzene, and total xylenes analyses were all between 10 and 50 percent FOD, suggesting that the Atchison adjustment should be employed before calculating the UTL. For trichloroethene (TCE), the data were both normally and log normally distributed (see Appendices E-2 and E-3) and the FOD was 100 percent; therefore, no adjustment was required, and the UTL was calculated directly.

The results of the UTL calculations and the comparison with each onsite well are presented in Table 7-2. Based on the number of analyses above the UTL for each onsite well, MW-3, MW-4, MW-7, MW-9, and MW-11 appear to differ from background with respect to the BTEX compounds. MW-4, MW-9, and MW-14S also appear to differ from background with respect to total chromium and copper. Note that the comparison of background UTLs to onsite wells described above is not definitive and will only be used in conjunction with the more in-depth statistical approaches that follow.

7.2 Comparison of Background and Onsite Wells

Overview

The recommended method for comparing onsite wells to background is the analysis of variance (ANOVA). There are two types of ANOVA — parametric and nonparametric. In order to use the parametric ANOVA, the data set must be normally or log normally distributed and the group variances must be equal. For the nonparametric approach, neither normality or equal variances are required, however, slightly larger datasets are needed to use a nonparametric method compared to the parametric ANOVA. The minimum number of analyses for the nonparametric test is 9, while for the parametric test, only 6 are required (EPA 1989).

The first assumption (normal or log normal distribution) should be tested using either the Shapiro-Wilk or probability plot method when the sample size is 50 or less. In general, the Shapiro-Wilk test is much more stringent than the probability plot since the method tends to focus on the "tails" of the

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distribution. The Lillifors, while not recommended in the Addendum, was suggested in the Interim Final Guidance (EPA 1989) and has been included for comparative purposes.

The test for equal group variances suggested in the Addendum to the Interim Final Guidance (EPA 1992) is the box plot. In a box plot, the extent of each box represent the 25th and 75th percentiles of the data set. Therefore, a long box tends to represent a larger variance than a short box. EPA (1992) recommends using a nonparametric ANOVA if the length of the largest box is equal to or greater than three times that of the smallest box. Another suggested criteria for a parametric ANOVA is a combined FOD, for both the background and the onsite well under consideration, of greater than 50 percent.

Methods

- Normality tests were performed only for TCE (see Appendix E of the October 1998 report), since for the other parameters, the combined FOD was <50 percent, precluding the use of the parametric ANOVA method. Results of the probability plot, and Shapiro-Wilk tests are presented in Table 7-3, while the raw data are in Appendices E-2 and E-3, respectively. Due to the stringent nature of the Shapiro-Wilk test, less weight was given to this test than the probability plots when conflicting results were obtained. Based on Table 7-3 of the October 1998 report, the TCE data are log normal in all wells except MW-3, MW-6B, MW-9, and MW-4. The log normal data distribution is typical of environmental datasets where various degrees of dilution have occurred. The lack of normality or log normality precluded the use of a parametric ANOVA for wells MW-3 MW-6B, and MW-9.
- In order to test the equal group variances assumption, box plots were constructed for TCE in each well (see Appendix E-4 of the October 1998 report). The results indicate that the background box is less than ⅓ the length of the box for well MW-6B, indicating that this well cannot be compared to background using a parametric ANOVA. However, all other wells met the equal variance requirement.
 - A summary of the ANOVA method used is as follows:
 - MW-4, MW-11, MW-14S, MW-15S, and MW-16 for TCE parametric ANOVA using ½ D.L. for nondetects
 - All other parameters and wells nonparametric, Kruskal Wallis Mann Whitney U Test
 - Note that ½ D.L. was used when the FOD was greater than 85 percent in a single well.

Results

The results of the nonparametric and parametric ANOVA tests are included in Appendices E-2 and E-3, respectively, while a summary is provided in Table 7-3. An "R" indicates that the null hypothesis was rejected, or that the two wells are not the same, while an "A" indicates the null hypothesis was accepted. In general, the results are similar to the UTL comparisons; except well MW-16 appears to differ from background with respect to the BTEX compounds. The results for TCE were obtained using both the normal and log normal assumptions for comparative purposes. The results indicate that, regardless of the data distribution, only well MW-6B was the same as background with respect to TCE. The results are the same as for last quarter.

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	Percent of 1 Quart		•	Table 7 hallow Wells 1989 to Jar	Reported					
Parameter	MW-1S	MW-3	MW-4	MW6B	MW-7	MW-9	MW-11	MW-14S	MW-15S	MW-16
Number Samples (n)	41	41	41	37	41	40	41	33	34	28
Metals (mg/L) (%)										
Hexavalent chromium	2.4	2.4	100.0	0	2.4	24.4	2.4	51.5	5.9	0
Total chromium	12.2	7.3	97.6	29.7	22.0	34.2	12.2	84.9	35.3	7.1
Cadmium	2.4	0	97.6	0	4.9	4.9	0	18.2	20.6	0
Copper	24.4	12.2	34.2	5.4	41.5	12.2	26.8	54.6	14.7	17.9
Aromatics (µg/L) (%)										
Benzene	2.4	12.2	17.1	0	22.0	7.3	0	18.2	0	0
Toluene	10.0	17.5	37.5	41.7	15.0	40.0	45.0	21.9	30.3	22.2
Ethylbenzene	31.7	51.2	85.4	43.2	43.9	73.2	87.8	75.8	55.9	82.1
Total xylenes	34.2	43.9	85.4	48.7	34.2	61.0	73.0	63.6	55.9	53.6
Halocarbons (μg/L) (%)										
Trichloroethene	100.0	97.6	92.7	100.0	100.0	92.7	95.1	100.0	97.0	100.0

% = Percent detected

Table 7-2 Definition of Upper Tolerance Levels in Background Shallow Wells Quarterly Data: January 1989 to January 1999 at Philbro-Tech, Inc. Upper Tolerance Limit Exceeded % Upper **Tolerance** MW-6B MW-7 MW-9 MW-11 MW-3 MW-4 MW-14S | MW-15S MW-16 Detected Limit Tolerance 40 ³ in Bkqd 1 Limit 2 40 36 40 40 40 32 Parameter Method 33 27 Metals (mg/L) 41 ⁴ Р 0.22 1 7 4 Hexavalent chromium 2.4 Total chromium 12.2 Α 0.046 2 41 (1) 1 2 12 14 (1) _ _ _ Р 2.4 0.14 32 _ Cadmium 10 (3) 3 (1) 12 (2) 24.4 Α 0.03 4(1) 4 (1) 8 (1) 10 3 Copper Aromatics (µg/L) 9 (7) 5 Р 27 (24) 1 (1) 5 (4) 28 (25) 18 (18) 4 (4) 1 (1) 10 (10) 2.4 1.31 Benzene 1.44 15 (8) 32 (17) 13 (1) 10 (7) 31 (15) 31 (13) 10.0 Α 9 (4) 17 (12) Toluene 10 (1) 31.7 Α 1.99 17 (3) 36 (2) 15 (1) 17 (5) 33 (4) 38 (3) 24 17 23 (2) Ethylbenzene 10 (3) 36 (3) 4 (1) 28 (4) 8 Total xylenes 34.2 Α 7.23 25 (3) 12 8 12 (4) Halocarbons (µg/L)

41 (3)

10

40

40 (3)

39

32

2

26

- In ppm or ppb, as noted for groups
- Number of samples collected at corresponding well
- ⁴ Number of samples that exceed upper tolerance level at corresponding well

Т

17.60

32 (1)

- 6) number of samples exceeding limit that are reported as ND
- = None of samples exceeded the upper tolerance limit

100.0

P = Poisson

Trichloroethene

- A = Atchison adjusted
- T = Unadjusted limit

MW-1S is background shallow well, n = 40

Table 7-3 Comparison of Background and Onsite Shallow Wells Quarterly Data: January 1989 to January 1999 at Phibro-Tech, Inc.									
Parameter	MW-3	MW-4	MW-6B	MW-7	MW-9	MW-11	MW-14S	MW-15S	MW-16
Metals (mg/L)									
Hexavalent chromium ¹	Α	R	Α	Α	R	Α	R	Α	Α
Total chromium 1	Α	R	R	Α	R	Α	R	Α	Α
Cadmium ¹	А	R	Α	Α	Α	Α	Α	Α	Α
Copper ¹	Α	Α	Α	Α	Α	Α	R	Α	Α
Aromatics (µg/L)									
Benzene ¹	R	R	Α	R	R	R	R	Α	R
Toluene ¹	R	R	R	R	R	R	R	Α	R
Ethylbenzene ¹	R	B	Α	R	R	R	R	R	В
Total xylenes 1	R	R	Α	Α	R	R	R	Α	R
Halocarbons (µg/L)									
Trichloroethene 2	R 3	R ⁴/R ⁵	A ³	R³	R/R	В³	R/R	R/R	R/R

- Background to onsite comparison by Mann Whitney U Method, using D.L. for ND, at 95 percent confidence
- Background to onsite comparison by one way ANOVA Method using ½ D.L. for ND
- Nonparametric comparison used for TCE
- Normal Distribution used in comparison
- ⁵ Log normal Distribution used in comparison
- A Null Hypothesis, that means are equal, is accepted
- R Null Hypothesis, that means are equal, is rejected
- R/R Null Hypothesis, rejected using parametric (top letter) and nonparametric (bottom letter) tests

Section 8

Assessment of Quarterly Groundwater Monitoring Program Status

In the October 1990 groundwater monitoring report, changes in the quarterly groundwater sampling program were proposed. These changes were first implemented during the April 1991 sampling event and included reducing the number of wells sampled and parameters analyzed in each well. The current groundwater sampling program will only be used as an interim groundwater sampling program, until a remediation alternative from the Corrective Measures Study (CMS) has been selected by EPA.

The analytical parameters for the January 1999 quarterly monitoring were as follows:

Wells	Purgeable Halogenated/ Aromatic Organics (EPA 8260)	Chromium, Cadmium, Copper	Hexavalent Chromium	рН
MW-01S, MW-01D	X	×	×	x
MW-03, MW-04A	×	X	X	x
MW-11 MW-06B	×	X	X	X
MW-06D, MW-07	×	X	X	x
MW-09, MW-04	×	X	X	x
MW-14S, MW-15S	×	X	X	X
MW-15D, MW-16	X	Х	X	X

Beginning with the January 1997 sampling event, EPA Method 8010/8020 was replaced with EPA Method 8260. This change was requested by the analytical laboratory, which no longer performs 8010/8020 analysis. Methyl tertiary butyl ether (MTBE) analysis was performed once, in January 1997. Since there were no detections of MTBE in any of the groundwater samples, this analysis was discontinued.

Statistical analysis has been conducted annually. Beginning with the October 1993 sampling event, statistical analysis has been performed on a quarterly basis, as requested by DTSC.

The proposed April 1999 quarterly monitoring includes sampling the 14 wells for purgeable halogenated/aromatic organics using EPA Method 8260, chromium, cadmium, copper, hexavalent chromium, and pH. The water levels at the 14 wells sampled, in addition to the remaining unsampled wells, will also be measured.

Section 9 References

January 19	esser & McKee Inc., Groundwater Modeling Study, Southern California Chemical, 1993.
	_, RCRA Facility Investigation Work Plan Addendum, Southern California Chemical, 13, 1992, Revised March 6, 1992.
	_, RCRA Facility Investigation Report, Southern California Chemical, December 6, 1991.
	_, RCRA Facility Investigation Work Plan, Southern California Chemical, June 26, 1990.
	_, Current Conditions Report, Southern California Chemical, June 8, 1990.
City of Sai	nta Fe Springs, 1996 Annual Water Quality Report, 1996.
J.H. Kleinf 1988.	felder & Associates, Quality Assurance Project Plan, Southern California Chemical, May
	_, Draft Environmental Assessment, Southern California Chemical, January 1986.

Appendix A General Analytical Detection Limits

TABLE A-1 PHIBRO-TECH, INC. HEAVY METALS AND INORGANICS ANALYSIS Typical Detection Limits

Method Number	Analytical Parameter	Detection Limit	Units
EPA 6010-L	Antimony	0.06	mg/L
EPA 6010-L	Barium	0.01	mg/L
EPA 6010-L	Beryllium	0.002	mg/L
EPA 6010-L	Cadmium	0.005	mg/L
EPA 6010-L	Chromium	0.01	mg/L
EPA 6010-L	Cobalt	0.01	mg/L
EPA 6010-L	Copper	0.02	mg/L
EPA 6010-L	Lead	0.05	mg/L
EPA 6010-L	Molybdenum	0.02	mg/L
EPA 6010-L	Nickel	0.04	mg/L
EPA 6010-L	Silver	0.01	mg/L
EPA 6010-L	Thallium	0.5	mg/L
EPA 6010-L	Tin	0.1	mg/L
EPA 6010-L	Vanadium	0.01	mg/L
EPA 6010-L	Zinc	0.02	mg/L
EPA 7196	Chromium, Hexavalent	0.02	mg/L
EPA 7061-L	Arsenic	0.005	mg/L
EPA 9012	Cyanide, Total	0.01	mg/L
EPA 7470	Mercury	0.001	mg/L
EPA 300.0	Chloride	5	mg/L
EPA 300.0	Nitrate	0.2	mg/L
EPA 7741-L	Selenium	0.1	mg/L
EPA 376.2	Sulfide, as Sulfur	1.2	mg/L

TABLE A-2 PHIBRO-TECH, INC. VOLATILE ORGANIC COMPOUNDS Typical Detection Limits

Method	Analytical	Detection	Units
Number	Parameter	Limit	
EPA 8260	Benzene	0.5	μg/L
EPA 8260	Toluene	1.0	μg/L
EPA 8260	Ethylbenzene	1.0	μg/L
EPA 8260	Xylenes, Total	1.0	μg/L
EPA 8260	Chloromethane	1.0	μg/L
EPA 8260	Bromomethane	1.0	μg/L
EPA 8260	Vinyl Chloride	1.0	μg/L
EPA 8260	Chloroethane	1.0	μg/L
EPA 8260	Methylene Chloride	1.0	μg/L
EPA 8260	Trichlorofluoromethane	1.0	μg/L
EPA 8260	1,1-Dichloroethene	1.0	μg/L
EPA 8260	1,1-Dichloroethane	1.0	μg/L
EPA 8260	trans-1,2-Dichloroethene	1.0	μg/L
EPA 8260	Chloroform	1.0	μg/L
EPA 8260	1,2-Dichloroethane	1.0	μg/L
EPA 8260	1,1,1-Trichloroethane	1.0	μg/L
EPA 8260	Carbon Tetrachloride	1.0	μg/L
EPA 8260	Bromodichloromethane	1.0	μg/L
EPA 8260	1,2-Dichloropropane	1.0	μg/L
EPA 8260	trans-1,3-Dichloropropene	1.0	μg/L
EPA 8260	Trichloroethene	1.0	μg/L
EPA 8260	Dibromochloromethane	1.0	μg/L
EPA 8260	1,1,2-Trichloroethane	1.0	μg/L
EPA 8260	cis-1,3-Dichloropropene	1.0	μg/L
EPA 8260	2-Chloroethylvinyl ether	1.0	μg/L_
EPA 8260	Bromoform	1.0	μg/L
EPA 8260	Tetrachloroethene	1.0	μg/L
EPA 8260	1,1,2,2-Tetrachloroethane	1.0	μg/L
EPA 8260	Chlorobenzene	1.0	μg/L
EPA 8260	1,2-Dichlorobenzene	1.0	μg/L
EPA 8260	1,3-Dichlorobenzene	1.0	μg/L
EPA 8260	1,4-Dichlorobenzene	1.0	μg/L

Appendix B Quanterra Analytical Reports



Quanterra Incorporated 1721 South Grand Avenue Santa Ana, California 92705

714 258-8610 Telephone 714 258-0921 Fax

February 15, 1999

QUANTERRA INCORPORATED PROJECT NUMBER: 135930

PO/CONTRACT: 2279 11462 FLD FIEL

Ed Vigil

Phibro-Tech, Inc.

8851 Dice Road

Santa Fe Springs, CA 90670

Dear Mr. Vigil,

This report contains the analytical results for the three samples received under chain of custody by Quanterra Incorporated on January 19, 1999. These samples are associated with your Wastewater project.

The case narrative is an integral part of this report.

If you have any questions, please feel free to call me at (714) 258-8610.

Sincerely,

Diane Suzuki

Project Manager

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QUANTERRA INCORPORATED PROJECT NUMBER 135930

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CASE NARRATIVE

QUANTERRA INCORPORATED PROJECT NUMBER 135930

All applicable internal quality control analyses including calibrations and calibration verifications, calibration (instrument) and method blanks, laboratory control samples (LCS), matrix spikes (MS) and matrix spike duplicates (MSD), and other QC met project-specified acceptance criteria. Any matrix-related anomalies are indicated using footnotes within the report. Any other anomalies are reported within the narrative.

There were no anomalies associated with this project.

Quanterra Environmental Services - Western Region Quality Control Definitions

QC Parameter:	Definition
QC Batch	A set of up to 20 field samples plus associated laboratory QC samples that are similar in composition (matrix) and that are processed within the same time period with the same reagent and standard lots.
Duplicate Control Sample (DCS)	Consist of a pair of LCSs analyzed within the same QC batch to monitor precision and accuracy independent of sample matrix effects. This QC is performed only if required by client or when insufficient sample is available to perform MS/MSD.
Duplicate Sample (DU)	A second aliquot of an environmental sample, taken from the same sample container when possible, that is processed independently with the first sample aliquot. The results are used to assess the effect of the sample matrix on the precision of the analytical process. The precision estimated using this sample is not necessarily representative of the precision for other samples in the batch.
Laboratory Control Sample (LCS)	A volume of reagent water for aqueous samples or a contaminant-free solid matrix (Ottawa sand) for soil and sediment samples which is spiked with known amounts of representative target analytes and required surrogates. An LCS is carried through the entire analytical process and is used to monitor the accuracy of the analytical process independent of potential matrix effects.
Matrix Spike and Matrix Spike Duplicate (MS/MSD)	A field sample fortified with known quantities of target analytes that are also added to the LCS. Matrix spike duplicate is a second matrix spike sample. MSs/MSDs are carried through the entire analytical process and are used to determine sample matrix effect on accuracy of the measurement system. The accuracy and precision estimated using MS/MSD is only representative of the precision of the sample that was spiked.
Method Blank (MB)	A sample composed of all the reagents (in the same quantities) in reagent water carried through the entire analytical process. The method blank is used to monitor the level of contamination introduced during sample preparation steps.
Surrogate Spike	Organic constituents not expected to be detected in environmental media and are added to every sample and QC at a known concentration. Surrogates are used to determine the efficiency of the sample preparation and the analytical process.

Source: Quanterra® Quality Control Program, Policy QA-003, Rev. 0, 8/19/96.

SAMPLE DESCRIPTION INFORMATION for Phibro-Tech, Inc.

				Sam	ple	ed	Rec	ceive	d
Lab ID	Client ID	Matrix	Ι	Date		Time	I	Date	
135930-0001-SA						15:10			
135930-0002-SA	PTI-MW01D-042	AQUEOUS	Τ9	JAN	99	16:00	ТЭ	JAN	99
135930-0003-TB	PTI-TB01-042	WATER-QA	19	JAN	99		19	JAN	99

Volatiles

Volatile Organic Compounds Method SW8260A

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW01S-042
LAB ID: 135930-0001-SA
Matrix: AQUEOUS
Authorized: 19 JAN 99
Instrument: GC/MS-MH

Received: 19 JAN 99 Analyzed: 22 JAN 99 Sampled: 19 JAN 99 Prepared: 22 JAN 99 Dilution: 1.0

Instrument:	GC/MS-MH	Dilution: 1.0	1		
Parameter		Result	Qualifier	RL	Units
Benzene		ND		0.50	ug/L
Bromodichloromet:	hane	ND		1.0	ug/L
Bromoform		ND		1.0	ug/L
Bromomethane		ND		1.0	ug/L
Carbon tetrachlo	ride	ND		1.0	ug/L
Chlorobenzene		ND		1.0	ug/L
Chloroethane		ND		1.0	ug/L
Chloroform		ND		1.0	ug/L
Chloromethane		ND		1.0	ug/L
Dibromochloromet	hane	ND		1.0	ug/L
1,2-Dichlorobenz	ene	ND		1.0	ug/L
1,3-Dichlorobenz	ene	ND		1.0	ug/L
1,4-Dichlorobenz		ND		1.0	ug/L
1,1-Dichloroetha	ne	1.2		1.0	ug/L
1,2-Dichloroetha		1.5		1.0	ug/L
1,1-Dichloroethe	ne	ND		1.0	ug/L
trans-1,2-Dichlo		ND		1.0	ug/L
1,2-Dichloroprop		ND		1.0	ug/L
cis-1,3-Dichloro		ND		1.0	ug/L
trans-1,3-Dichlo		ND		1.0	ug/L
Ethylbenzene		2.0		1.0	ug/L
Methylene chlorie	de	ND		1.0	ug/L
1,1,2,2-Tetrachle	oroethane	ND		1.0	ug/L
Tetrachloroethen	e	1.9		1.0	ug/L
Toluene		ND		1.0	ug/L
1,1,1-Trichloroe	thane	ND		1.0	ug/L
1,1,2-Trichloroe	thane	ND		1.0	ug/L
Trichloroethene		10		1.0	ug/L
Trichlorofluorom	ethane	ND		1.0	ug/L
Vinyl chloride		ND		1.0	ug/L
Xylenes (total)		ND		1.0	ug/L
2-Chloroethyl vi	nyl ether	ND		1.0	ug/L
Surrogate		Recover	У	Acceptabl	e Range
1,2-Dichloroetha	ne-d4	94	8	80 -	125
Toluene-d8		104	*	80 -	125
Bromofluorobenze:	ne	117	8	80 -	125

Volatile Organic Compounds Method SW8260A

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW01D-042
LAB ID: 135930-0002-SA
Matrix: AQUEOUS

Matrix: AQUEOUS Sampled: 19 JAN 99 Received: 19 JAN 99 Authorized: 19 JAN 99 Prepared: 22 JAN 99 Analyzed: 22 JAN 99

	Instrument:	GC/MS-MH	Dilution: 1.0		<i>1</i>	
_	Parameter		Result Q	ualifier	RL	Units
•	Benzene		ND		0.50	ug/L
	Bromodichlorom	ethane	ND		1.0	ug/L
	Bromoform		ND		1.0	ug/L
ونفسان	Bromomethane		ND		1.0	ug/L
_	Carbon tetrach	loride	ND		1.0	ug/L
	Chlorobenzene		ND		1.0	ug/L
	Chloroethane		ND		1.0	ug/L
-	Chloroform		ND		1.0	ug/L
	Chloromethane		ND		1.0	ug/L
	Dibromochlorom	ethane	ND		1.0	ug/L
	1,2-Dichlorobe	nzene	ND		1.0	ug/L
	1,3-Dichlorobe	nzene	ND		1.0	ug/L
	1,4-Dichlorobe	nzene	ND		1.0	ug/L
	1,1-Dichloroet	hane	ND		1.0	ug/L
Maria	1,2-Dichloroet	hane	ND		1.0	ug/L
_	1,1-Dichloroet	hene	ND		1.0	ug/L
	trans-1,2-Dich	loroethene	ND		1.0	ug/L
	1,2-Dichloropr	opane	ND		1.0	ug/L
-	cis-1,3-Dichlo		ND		1.0	ug/L
	trans-1,3-Dich	loropropene	ND		1.0	ug/L
	Ethylbenzene		1.0		1.0	ug/L
	Methylene chlo	ride	ND		1.0	ug/L
	1,1,2,2-Tetrac	hloroethane	ND		1.0	ug/L
	Tetrachloroeth	ene	ND		1.0	ug/L
	Toluene		ND		1.0	ug/L
	1,1,1-Trichlor	oethane	ND		1.0	ug/L
-	1,1,2-Trichlor		ND		1.0	ug/L
	Trichloroethen		2.0		1.0	ug/L
	Trichlorofluor		ND		1.0	ug/L
	Vinyl chloride		ND		1.0	ug/L
	Xylenes (total		ND		1.0	ug/L
	2-Chloroethyl	vinyl ether	ND		1.0	ug/L
-	Surrogate		Recovery		Acceptable	e Range
	1,2-Dichloroet	hane-d4	122	8	80 -	
	Toluene-d8		105	육	80 -	
	Bromofluoroben	zene	112	*	80 -	125

Volatile Organic Compounds Method SW8260A

Client Name: Phibro-Tech, Inc.
Client ID: PTI-TB01-042

LAB ID: 135930-0003-TB
Matrix: WATER-QA

Matrix: WATER-QA Sampled: 19 JAN 99 Received: 19 JAN 99 Authorized: 19 JAN 99 Prepared: 21 JAN 99 Analyzed: 21 JAN 99

Instrument: GC/MS-MH	Dilution: 1.0	JJ Initiary 2	ed. Zi UAN .
Parameter	Result Qua	lifier RL	Units
Benzene	ND	0.50	ug/L
Bromodichloromethane	ND	1.0	ug/L
Bromoform	ND	1.0	ug/L
Bromomethane	ND	1.0	ug/L
Carbon tetrachloride	ND	1.0	ug/L
Chlorobenzene	ND	1.0	ug/L
Chloroethane	ND	1.0	ug/L
Chloroform	ND	1.0	ug/L
Chloromethane	ND	1.0	ug/L
Dibromochloromethane	ND	1.0	ug/L
1,2-Dichlorobenzene	ND	1.0	ug/L
1,3-Dichlorobenzene	ND	1.0	ug/L
1,4-Dichlorobenzene	ND	1.0	ug/L
1,1-Dichloroethane	ND	1.0	ug/L
1,2-Dichloroethane	ND	1.0	ug/L
1,1-Dichloroethene	ND	1.0	ug/L
rans-1,2-Dichloroethene	ND	1.0	ug/L
1,2-Dichloropropane	ND	1.0	ug/L
cis-1,3-Dichloropropene	ND	1.0	ug/L
rans-1,3-Dichloropropene	ND	1.0	ug/L
Sthylbenzene	ND	1.0	ug/L
Methylene chloride	2.1	1.0	ug/L
,1,2,2-Tetrachloroethane	ND	1.0	ug/L
Tetrachloroethene	ND	1.0	ug/L
Coluene	ND	1.0	ug/L
1,1,1-Trichloroethane	ND	1.0	ug/L
1,1,2-Trichloroethane	ND	1.0	ug/L
Trichloroethene	ND	1.0	ug/L
Trichlorofluoromethane	ND	1.0	ug/L
/inyl chloride	ND	1.0	ug/L
Xylenes (total)	ND	1.0	ug/L
2-Chloroethyl vinyl ether	ND	1.0	ug/L
Surrogate	Recovery	Acceptable	e Range
1,2-Dichloroethane-d4	102	¥ 80 -	125
Toluene-d8	109	¥ 80 -	125
Bromofluorobenzene	100	% 80 -	125

ND = Not Detected

QC LOT ASSIGNMENT REPORT - MS QC Volatile Organics by GC/MS

144	Laboratory Sample Number	QC Matrix	QC Category	QC Lot Number (DCS)	QC Run Number (SCS/BLANK/LCS)	MS QC Run Number (SA,MS,SD,DU)	
	135930-0001-SA	AQUEOUS	Q8260-A		22 JAN 99-AHX	22 JAN 99-AH	
	135930-0002-SA	AQUEOUS	Q8260-A		22 JAN 99-AHX	22 JAN 99-AH	
ė.	135930-0003-TB	AQUEOUS	Q8260-A		21 JAN 99-AHX	22 JAN 99-AH	

METHOD BLANK REPORT

Volatile Organics by GC/MS

Project: 135930

Method SW8260B - Volatile Organics - 25 mL

Test: Q8260-DW-AP
Matrix: AQUEOUS
QC Run: 22 JAN 99-AHX Date Analyzed: 22 JAN 99

QC Ruii: 22 UAN 99-AHA			Date Analyzed: 22 DAN 93
7 1 t -	Page 14	77m d to	Reporting
Analyte	Result	Units	Limit
Benzene	ND	ug/L	0.50
Bromodichloromethane	ND	ug/L	1.0
Bromoform	ND	ug/L	1.0
Bromomethane	ND	ug/L	1.0
Carbon tetrachloride	ND	ug/L	1.0
hlorobenzene	ND	ug/L	1.0
Chloroethane	ND	ug/L	1.0
Chloroform	ND	ug/L	1.0
Chloromethane	ND	ug/L	1.0
Dibromochloromethane	ND	ug/L	1.0
,2-Dichlorobenzene	ND	ug/L	1.0
,3-Dichlorobenzene	ND	ug/L	1.0
,4-Dichlorobenzene	ND	ug/L	1.0
,1-Dichloroethane	ND	ug/L	1.0
1,2-Dichloroethane	ND	ug/L	1.0
,1-Dichloroethene	ND	ug/L	1.0
rans-1,2-Dichloroethene	ND	ug/L	1.0
,2-Dichloropropane	ND	ug/L	1.0
is-1,3-Dichloropropene	ND	ug/L	1.0
rans-1,3-Dichloropropene	ND	ug/L	1.0
thylbenzene	ND	ug/L	1.0
ethylene chloride	ND	ug/L	1.0
,1,2,2-Tetrachloroethane	ND	ug/L	1.0
Tetrachloroethene	ND	ug/L	1.0
Coluene	ND	ug/L	1.0
,1,1-Trichloroethane	ND	ug/L	1.0
,1,2-Trichloroethane	ND	ug/L	1.0
richloroethene	ND	ug/L	1.0
Trichlorofluoromethane	ND	ug/L	1.0
Vinyl chloride	ND	ug/L	1.0
(ylenes (total)	ND	ug/L	1.0
2-Chloroethyl vinyl ether	ND	ug/L	1.0
Gurrogate	Recovery	Acceptabl	le Range
,2-Dichloroethane-d4	112	80 -125	
Toluene-d8	105	80 -125	

METHOD BLANK REPORT (cont.) Volatile Organics by GC/MS

Project: 135930

Test: Q8260-DW-AP Method SW8260B - Volatile Organics - 25 mL (cont.)
Matrix: AQUEOUS

QC Run: 21 JAN 99-AHX			Date Analyzed: 21 JAN 9 Reporting
Analyte	Result	Units	Limit
Benzene	ND	ug/L	0.50
Bromodichloromethane	ND	ug/L	1.0
Bromoform	ND	ug/L	1.0
Bromomethane	ND	ug/L	1.0
Carbon tetrachloride	N D	ug/L	1.0
Chlorobenzene	ND	ug/L	1.0
Chloroethane	ND	ug/L	1.0
Chloroform	ND	ug/L	1.0
Chloromethane	ND	ug/L	1.0
Dibromochloromethane	ND	ug/L	1.0
1,2-Dichlorobenzene	ND	ug/L	1.0
1,3-Dichlorobenzene	ND	ug/L	1.0
1,4-Dichlorobenzene	ND	ug/L	1.0
1,1-Dichloroethane	ND	ug/L	1.0
1,2-Dichloroethane	ND	ug/L	1.0
1,1-Dichloroethene	ND	ug/L	1.0
trans-1,2-Dichloroethene	ND	ug/L	1.0
1,2-Dichloropropane	ND	ug/L	1.0
cis-1,3-Dichloropropene	ND	ug/L	1.0
trans-1,3-Dichloropropene	ND	ug/L	1.0
Ethylbenzene	ND	ug/L	1.0
Methylene chloride	ND	ug/L	1.0
1,1,2,2-Tetrachloroethane	ND	ug/L	1.0
Tetrachloroethene	ND	ug/L	1.0
Toluene	ND	ug/L	1.0
1,1,1-Trichloroethane	ND	ug/L	1.0
1,1,2-Trichloroethane	ND	ug/L	1.0
Trichloroethene	ND	ug/L	1.0
Trichlorofluoromethane	ND	ug/L	1.0
Vinyl chloride	ND	ug/L	1.0
Xylenes (total)	ND	ug/L	1.0
2-Chloroethyl vinyl ether	ND	ug/L	1.0
Surrogate	Recovery	Acceptabl	le Range
1,2-Dichloroethane-d4	101	80 -125	
Toluene-d8	104	80 -125	

ND = Not Detected

Bromofluorobenzene

99 80 -125

LABORATORY CONTROL SAMPLE REPORT

Volatile Organics by GC/MS

Project: 135930

Analyte

Category: Q8260-A Method SW8260B - Volatile Organics

Matrix: AQUEOUS Date Analyzed: 22 JAN 99 QC Run: 22 JAN 99-AHX

Concentration

Spiked Measured

Accuracy(%) LCS Limits

QC Run: 22 JAN 99-AHX
Concentration Units: ug/L

****	1,1-Dichloroethene	10.0	9.22	92	70-135
	Trichloroethene	10.0	9.98	100	70-130
	Benzene	10.0	9.49	95	80-120
أثثثنا	Toluene	10.0	9.50	95	80-120
	Chlorobenzene	10.0	9.67	97	80-120
		Concer	ntration	Accu	racy(%)
	Surrogates	Spiked	Measured	LCS	Limits
	1,2-Dichloroethane-d4	10.0	8.12	81	80-125
	Bromofluorobenzene	10.0	10.5	105	80-125
	Toluene-d8	10.0	10.3	103	80-125

Category: Q8260-A Method SW8260B - Volatile Organics

Matrix: AQUEOUS Date Analyzed: 21 JAN 99

QC Run: 21 JAN 99-AHX Concentration Units: ug/L

		Concer	ntration	Accur	acy(%)
	Analyte	Spiked	Measured	LCS	Limits
	1,1-Dichloroethene	10.0	9.77	98	70-135
	Trichloroethene	10.0	9.88	99	70-130
	Benzene	10.0	10.1	101	80-120
	Toluene	10.0	10.2	102	80-120
	Chlorobenzene	10.0	10.1	101	80-120
				_	(5)
		Conce	ntration	Accur	cacy(%)
	Surrogates	Spiked	Measured	LCS	Limits
	1,2-Dichloroethane-d4	10.0	11.7	117	80-125
_	Bromofluorobenzene	10.0	11.1	111	80-125
	Toluene-d8	10.0	10.9	109	80-125
	TOTACHE AU	10.0	20.5	100	

_ Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE QC REPORT

Volatile Organics by GC/MS

Project: 135930

Category: Q8260-A Method SW8260B - Volatile Organics

110

106

Matrix: AQUEOUS Sample: 135936-0001 MS Run: 22 JAN 99-AH

Units: ug/L

Bromofluorobenzene

Toluene-d8

-		Cond	centration					
Analyte	Sample Result	MS Result	MSD Result	Amount Spiked MS/MSD	%Recove	ery %RPD	Accepta Limi Recov.	
Alaryce	Result	Result	Result	M3/ M3D	MS MS	שנ	RECOV.	KFD
1,1-Dichloroethene	ND	9.81	9.74	10.0	98	97 0.7	70-135	25
Trichloroethene	ND	10.7	10.6	10.0	107	106 0.8	70-130	25
Benzene	ND	10.1	10.0	10.0	101	100 1.1	80-120	25
Toluene	ND	10.0	9.88	10.0	100	99 1.4	80-120	25
Chlorobenzene	ND	10.4	10.4	10.0	104	104 0.8	80-120	25
	Sample			%Rec	overy	Acc	eptance :	Limit
Surrogates	%Recovery			MS	MSI)	Recover	У
1,2-Dichloroethane-d4	125			129 I	127	7 I	80-125	

112

102

80-125

80-125

113

103

= Surrogate recovery outside of limits due to sample matrix interference.

^{) =} Not Detected

Metals

METALS (Water)

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW01S-042
LAB ID: 135930-0001-SA
Matrix: AQUEOUS
Authorized: 19 JAN 99

Sampled: 19 JAN 99 Received: 19 JAN 99 Prepared: See Below Analyzed: See Below

•	Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
•	Cadmium	ND	1.0	0.0050	mg/L	6010B	20 JAN 99	20 JAN 99
	Chromium	ND	1.0	0.010	mg/L	6010B	20 JAN 99	20 JAN 99
	Copper	ND	1.0	0.020	mg/L	6010B	20 JAN 99	20 JAN 99

METALS (Water)

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW01D-042
LAB ID: 135930-0002-SA
Matrix: AQUEOUS
Authorized: 19 JAN 99

Sampled: 19 JAN 99 Prepared: See Below Received: 19 JAN 99 Analyzed: See Below

Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
Cadmium	ND	1.0	0.0050	mg/L	6010B	20 JAN 99	21 JAN 99
Chromium	ND	1.0	0.010	mg/L	6010B	20 JAN 99	21 JAN 99
Copper	ND	1.0	0.020	mg/L	6010B	20 JAN 99	21 JAN 99

QC LOT ASSIGNMENT REPORT - MS QC Metals Analysis and Preparation

_	Laboratory Sample Number	QC Matrix	QC Category	QC Lot Number (DCS)	QC Run Number (SCS/BLANK/LCS)	MS QC Run Number (SA,MS,SD,DU)	
	135930-0001-SA 135930-0002-SA	AQUEOUS AQUEOUS	QICP-A OICP-A			20 JAN 99-AA 20 JAN 99-AA	

METHOD BLANK REPORT

Metals Analysis and Preparation

Project: 135930

Method 6010B - ICP Metals

Test: Q-ICP-AR
Matrix: AQUEOUS
QC Run: 20 JAN 99-AX

Date Analyzed: 14 JAN 99

Reporting

Analyte	Result	Units	Limit
Cadmium Chromium	ND ND	mg/L mg/L	0.0050 0.010
Copper	ND	mg/L	0.020

LABORATORY CONTROL SAMPLE REPORT Metals Analysis and Preparation

Project: 135930

Category: QICP-A Method 6010B - ICP Metals

Date Analyzed: 14 JAN 99

Matrix: AQUEOUS QC Run: 20 JAN 99-AX

Concentration Units: mg/L

	Concentration			Accuracy(%)		
Analyte	Spiked	Measured	LCS	Limits		
Cadmium	0.0500	0.0562	112	80-120		
Chromium	0.200	0.211	105	80-115		
Copper	0.250	0.272	109	85-115		

MATRIX SPIKE/MATRIX SPIKE DUPLICATE QC REPORT

Metals Analysis and Preparation

Project: 135930

Category: QICP-A Method 6010B - ICP Metals

Matrix: AQUEOUS
Sample: 135904-0001
MS Run: 20 JAN 99-AA
Units: mg/L

		Conc	entration					
Analyte	Sample Result	MS Result	MSD Result	Amount Spiked MS/MSD		ery %RPD SD	Acceptar Limit Recov.	
Cadmium Chromium Copper	ND ND ND	0.0489 0.204 0.271	0.0547 0.197 0.265	0.0500 0.200 0.250	98 102 108	109 11 99 3.3 106 2.3	80-120 80-115 85-115	20

N = Not Detected

General Chemistry

GENERAL INORGANICS

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW01S-042
LAB ID: 135930-0001-SA
Matrix: AQUEOUS
Authorized: 19 JAN 99

Sampled: 19 JAN 99
Prepared: See Below Received: 19 JAN 99
Analyzed: See Below

	Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
-	Chromium, Hexavalent pH	ND 6.7	1.0	0.010 NA	mg/L units	SW7196 SW9040	NA NA	19 JAN 99 19 JAN 99

GENERAL INORGANICS

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW01D-042
LAB ID: 135930-0002-SA
Matrix: AQUEOUS
Authorized: 19 JAN 99

Prepared: 19 JAN 99 Sampled: 19 JAN 99

Received: 19 JAN 99 Analyzed: See Below

-	Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
	Chromium, Hexavalent pH	ND 7.2	1.0	0.010 NA	mg/L units	SW7196 SW9040	NA NA	19 JAN 99 19 JAN 99

QC LOT ASSIGNMENT REPORT - MS QC
Wet Chemistry Analysis and Preparation

-	Sample Number	QC Matrix	QC Category	(DCS)	(SCS/BLANK/LCS)	(SA, MS, SD, DU)
-	135930-0001-SA 135930-0002-SA	-	QCR6-A QCR6-A			19 JAN 99-AA 19 JAN 99-AA

METHOD BLANK REPORT

Wet Chemistry Analysis and Preparation

Project: 135930

Test: Q-CR6-A Method SW7196A - Chromium, Hexavalent

Test: Q-CR6-A Matrix: AQUEOUS

QC Run: 19 JAN 99-AX Date Analyzed: 19 JAN 99

Reporting

Analyte Result Units Limit

Chromium, Hexavalent ND mg/L 0.020

LABORATORY CONTROL SAMPLE REPORT
Wet Chemistry Analysis and Preparation

Project: 135930

Category: QCR6-A Method 7196 - Chromium, Hexavalent

Matrix: AQUEOUS Date Analyzed: 19 JAN 99

QC Run: 19 JAN 99-AX

Concentration Units: mg/L

		Conce	Accuracy (%)		
ı	Analyte	Spiked	Measured	LCS	Limits
	Chromium, Hexavalent	0.0500	0.0484	97	85-115

MATRIX SPIKE/MATRIX SPIKE DUPLICATE QC REPORT

Wet Chemistry Analysis and Preparation

Project: 135930

Category: QCR6-A Method 7196 - Chromium, Hexavalent

Category: QCR6-A Me Matrix: AQUEOUS Sample: 135930-0002 MS Run: 19 JAN 99-AA

Units: mg/L

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		COLLO							
•				Amount				Acceptar	nce
	Sample	MS	MSD	Spiked	%Recov	ery %	RPD	Limit	t
Analyte	Result	Result	Result	MS/MSD	MS M	ISD		Recov.	RPD
Chromium, Hexavalent	ND	0.0496	0.0520	0.0500	99	104	4.7	85-115	20

1 ' = Not Detected

QC LOT ASSIGNMENT REPORT - MS QC GC/MS Preparation

•	Laboratory Sample Number	QC Matrix	QC Category	QC Lot Number (DCS)	QC Run Number (SCS/BLANK/LCS)	(SA, MS, SD, DU)
	135930-0001-SA 135930-0002-SA	AQUEOUS AQUEOUS	PH-A PH-A		19 JAN 99-AX 19 JAN 99-AX	

LABORATORY CONTROL SAMPLE REPORT

GC/MS Preparation Project: 135930

Category: PH-A p Matrix: AQUEOUS QC Run: 19 JAN 99-AX pH for Aqueous Samples

Date Analyzed: 19 JAN 99

Concentration Units: units

	Concentration			Accuracy(%)	
Analyte	Spiked	Measured		LCS	Limits
Н	9.18	9.13		99	98-102

MATRIX DUPLICATE QC REPORT

GC/MS Preparation Project: 135930

Category: PH-A pH for Aqueous Samples

Matrix: AQUEOUS
Sample: 135930-0001
MS Run: 19 JAN 99-AB
Units: units

***	Concentration					
	Analyte	Sample	Duplicate	%RPD SA-DU	Acceptance Limit	
	рн	6.69	6.71	0.30	30	



Quanterra Incorporated 1721 South Grand Avenue Santa Ana, California 92705

714 258-8610 Telephone 714 258-0921 Fax

February 05, 1999

QUANTERRA INCORPORATED PROJECT NUMBER: 135968 PO/CONTRACT: 2000 – PTI Wastewater

Ed Vigil Phibro-Tech, Inc. 8851 Dice Road Santa Fe Springs, CA 90670

Dear Mr. Vigil,

This report contains the analytical results for the eight samples received under chain of custody by Quanterra Incorporated on January 21, 1999. These samples are associated with your Wastewater project.

The case narrative is an integral part of this report.

beil epis for

If you have any questions, please feel free to call me at (714) 258-8610.

Sincerely,

Diane Suzuki Project Manager

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General Chemistry

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CASE NARRATIVE

QUANTERRA INCORPORATED PROJECT NUMBER 135968

All applicable internal quality control analyses including calibrations and calibration verifications, calibration (instrument) and method blanks, laboratory control samples (LCS), matrix spikes (MS) and matrix spike duplicates (MSD), and other QC met project-specified acceptance criteria. Any matrix-related anomalies are indicated using footnotes within the report. Any other anomalies are reported within the narrative.

There were no anomalies associated with this project.

Quanterra Environmental Services - Western Region Quality Control Definitions

QC Parameter	Definition
QC Batch	A set of up to 20 field samples plus associated laboratory QC samples that are similar in composition (matrix) and that are processed within the same time period with the same reagent and standard lots.
Duplicate Control Sample (DCS)	Consist of a pair of LCSs analyzed within the same QC batch to monitor precision and accuracy independent of sample matrix effects. This QC is performed only if required by client or when insufficient sample is available to perform MS/MSD.
Duplicate Sample (DU)	A second aliquot of an environmental sample, taken from the same sample container when possible, that is processed independently with the first sample aliquot. The results are used to assess the effect of the sample matrix on the precision of the analytical process. The precision estimated using this sample is not necessarily representative of the precision for other samples in the batch.
Laboratory Control Sample (LCS)	A volume of reagent water for aqueous samples or a contaminant-free solid matrix (Ottawa sand) for soil and sediment samples which is spiked with known amounts of representative target analytes and required surrogates. An LCS is carried through the entire analytical process and is used to monitor the accuracy of the analytical process independent of potential matrix effects.
Matrix Spike and Matrix Spike Duplicate (MS/MSD)	A field sample fortified with known quantities of target analytes that are also added to the LCS. Matrix spike duplicate is a second matrix spike sample. MSs/MSDs are carried through the entire analytical process and are used to determine sample matrix effect on accuracy of the measurement system. The accuracy and precision estimated using MS/MSD is only representative of the precision of the sample that was spiked.
Method Blank (MB)	A sample composed of all the reagents (in the same quantities) in reagent water carried through the entire analytical process. The method blank is used to monitor the level of contamination introduced during sample preparation steps.
Surrogate Spike	Organic constituents not expected to be detected in environmental media and are added to every sample and QC at a known concentration. Surrogates are used to determine the efficiency of the sample preparation and the analytical process.

Source: Quanterra® Quality Control Program, Policy QA-003, Rev. 0, 8/19/96.

SAMPLE DESCRIPTION INFORMATION for Phibro-Tech, Inc.

					San	ıpΙe	edi	Red	ceive	ed
•	Lab ID	Client ID	Matrix	I	Date		Time	I	Date	
	135968-0001-SA	PTI-MW03-042	AQUEOUS	21	JAN	99	11:15	21	JAN	99
	135968-0002-SA	PTI-MW11-042	AQUEOUS	21	JAN	99	12:10	21	JAN	99
	135968-0003-SA	PTI-MW06B-042	AQUEOUS	21	JAN	99	13:10	21	JAN	99
	135968-0004-SA	PTI-MW06D-042	AQUEOUS	21	JAN	99	14:15	21	JAN	99
	135968-0005-SA	PTI-MW07-042	AQUEOUS	21	JAN	99	15:30	21	JAN	99
	135968-0006-SA	PTI-MW04A-042	AQUEOUS	21	JAN	99	16:45	21	JAN	99
	135968-0007-EB	PTI-EB01-042	AQUEOUS	21	JAN	99	15:15	21	JAN	99
	135968-0008-TB	PTI-TB02-042	AQUEOUS	21	JAN	99		21	JAN	99

Volatiles

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW03-042
LAB ID: 135968-0001-SA

Matrix: AQUEOUS Sampled: 21 JAN 99 Received: 21 JAN 99
Authorized: 21 JAN 99 Prepared: 24 JAN 99 Analyzed: 24 JAN 99

Instrument: GC/MS-MH Dilution: 1.0

	Instrument:	GC/MS-MH	Dilution:	1.0			
	Parameter		Res	ult Qua	lifier	\mathtt{RL}	Units
-	Benzene		ND			0.50	ug/L
	Bromodichlorom	ethane	ND			1.0	ug/L
	Bromoform		ND			1.0	ug/L
	Bromomethane		ND			1.0	ug/L
	Carbon tetrach	loride	23			1.0	ug/L
	Chlorobenzene		ND			1.0	ug/L
	Chloroethane		ND			1.0	ug/L
	Chloroform		16			1.0	ug/L
	Chloromethane		ND			1.0	ug/L
	Dibromochlorom	ethane	ND			1.0	ug/L
	1,2-Dichlorober	nzene	ND			1.0	ug/L
	1,3-Dichlorober	nzene	ND			1.0	\mathtt{ug}/\mathtt{L}
	1,4-Dichlorober	nzene	ND			1.0	\mathtt{ug}/\mathtt{L}
	1,1-Dichloroet	hane	2	. 4		1.0	\mathtt{ug}/\mathtt{L}
	1,2-Dichloroet	hane	ND			1.0	\mathtt{ug}/\mathtt{L}
	1,1-Dichloroet	hene	3	.9		1.0	ug/L
	trans-1,2-Dich	loroethene	ND			1.0	ug/L
	1,2-Dichloropro	opane	ND			1.0	\mathtt{ug}/\mathtt{L}
-	cis-1,3-Dichlo	ropropene	ND			1.0	ug/L
_	trans-1,3-Dich	loropropene	ND			1.0	ug/L
	Ethylbenzene		2	.3		1.0	ug/L
	Methylene chlo		ND			1.0	ug/L
-	1,1,2,2-Tetracl	hloroethane	ND			1.0	ug/L
	Tetrachloroeth	ene	1	. 9		1.0	ug/L
	Toluene		ND			1.0	ug/L
	1,1,1-Trichlore		ND			1.0	ug/L
-	1,1,2-Trichlore		ND			1.0	ug/L
	Trichloroethene		26			1.0	ug/L
	Trichlorofluor	omethane	ND			1.0	ug/L
نسن	Vinyl chloride		ND			1.0	ug/L
_	Xylenes (total)		ND			1.0	ug/L
	2-Chloroethyl	vinyl ether	ND			1.0	ug/L
-	Surrogate		Rec	overy	1	Acceptabl	e Range
	1,2-Dichloroet	hane-d4	10	8	ક	80 -	
	Toluene-d8		9	9	8	80 -	
-	Bromofluoroben	zene	10	3	8	80 -	125

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW11-042
LAB ID: 135968-0002-SA
Matrix: AQUEOUS
Authorized: 21 JAN 99

Matrix: AQUEOUS Sampled: 21 JAN 99 Received: 21 JAN 99
Authorized: 21 JAN 99 Prepared: 24 JAN 99 Analyzed: 24 JAN 99

	Instrument:	GC/MS-MH	Dilution: 12	EN JJ	maryzca. Zw DAN 9.
	Parameter		Result Q	ualifier	RL Units
-	Benzene		ND	6.	.2 ug/L
	Bromodichlorom	ethane	ND	12	ug/L
	Bromoform		ND	12	ug/L
	Bromomethane		ND	12	ug/L
	Carbon tetrach	loride	ND	12	ug/L
	Chlorobenzene		ND	12	ug/L
	Chloroethane		ND	12	ug/L
-	Chloroform		26	12	ug/L
	Chloromethane		ND	12	ug/L
	Dibromochlorom	ethane	ND	12	ug/L
	1,2-Dichlorober		ND	12	ug/L
-	1,3-Dichlorober	nzene	ND	12	ug/L
	1,4-Dichlorober		ND	12	ug/L
	1,1-Dichloroet		190	12	ug/L
	1,2-Dichloroeth		17	12	ug/L
	1,1-Dichloroeth		59	12	ug/L
	trans-1,2-Dich	loroethene	ND	12	ug/L
	1,2-Dichloropro	opane	ND	12	ug/L
	cis-1,3-Dichlor	ropropene	ND	12	ug/L
_	trans-1,3-Dich	loropropene	ND	12	ug/L
	Ethylbenzene		750	12	ug/L
	Methylene chlor		ND	12	ug/L
	1,1,2,2-Tetrack		ND	12	ug/L
	Tetrachloroethe	ene	ND	12	ug/L
	Toluene		260	12	ug/L
	1,1,1-Trichlore		ND	12	ug/L
-	1,1,2-Trichlore		ND	12	ug/L
	Trichloroethene		690	12	ug/L
	Trichlorofluoro	omethane	ND	12	ug/L
-	Vinyl chloride		ND	12	ug/L
	Xylenes (total)	·	970	12	ug/L
	2-Chloroethyl	vinyl ether	ND	12	ug/L
•	Surrogate		Recovery	Acce	ptable Range
	1,2-Dichloroeth	nane-d4	97	8	80 - 125
	Toluene-d8		103	*	80 - 125
	Bromofluorobenz	zene	110	8	80 - 125

Client Name: Phibro-Tech, Inc. Client ID: PTI-MW06B-042 LAB ID: 135968-0003-SA

Sampled: 21 JAN 99 Received: 21 JAN 99
Prepared: 24 JAN 99
Analyzed: 24 JAN 99 **AQUEOUS** Matrix: Authorized: 21 JAN 99 Prepared: 24 J Instrument: GC/MS-MH Dilution: 1.0

Instrument:	GC/MS-MH	Dilutio	n: 1.0			
Parameter		R	esult	Qualifier	RL	Units
Benzene			ND		0.50	ug/L
Bromodichlorometha	ane		ND		1.0	ug/L
Bromoform			ND		1.0	ug/L
Bromomethane			ND		1.0	ug/L
Carbon tetrachlor:	ide		ND		1.0	ug/L
Chlorobenzene			ND		1.0	ug/L
Chloroethane			ND		1.0	ug/L
Chloroform			ND		1.0	ug/L
Chloromethane			ND		1.0	ug/L
Dibromochlorometha	ane		ND		1.0	ug/L
1,2-Dichlorobenzer	ne		ND		1.0	ug/L
1,3-Dichlorobenzer	ne		ND		1.0	ug/L
1,4-Dichlorobenzer		;	ND		1.0	ug/L
1,1-Dichloroethane			1.3		1.0	ug/L
1,2-Dichloroethane		;	ND		1.0	ug/L
1,1-Dichloroethene	e		ND		1.0	ug/L
trans-1,2-Dichlore	oethene		ND		1.0	ug/L
1,2-Dichloropropar			ND		1.0	ug/L
cis-1,3-Dichloropa	ropene		ND		1.0	ug/L
trans-1,3-Dichlore	opropene	1	ND		1.0	ug/L
Ethylbenzene			24		1.0	ug/L
Methylene chloride	е		ND		1.0	ug/L
1,1,2,2-Tetrachlor	roethane	;	ND		1.0	ug/L
Tetrachloroethene			1.2		1.0	ug/L
Toluene			5.0		1.0	ug/L
1,1,1-Trichloroeth	nane	:	ND		1.0	ug/L
1,1,2-Trichloroeth	nane	:	ND		1.0	ug/L
Trichloroethene			17		1.0	ug/L
Trichlorofluoromet	thane	:	ND		1.0	ug/L
Vinyl chloride			ND		1.0	ug/L
Xylenes (total)			29		1.0	ug/L
2-Chloroethyl viny	yl ether	:	ND		1.0	ug/L
Surrogate		R	ecover	У	Acceptal	ole Range
1,2-Dichloroethane	e-d4		101	8	80	- 125
Toluene-d8			100	육		- 125
Bromofluorobenzene	e		109	용	80	- 125

ND = Not Detected

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW06D-042
LAB ID: 135968-0004-SA
Matrix: AQUEOUS

LAB ID:
Matrix:
Authorized: Sampled: 21 JAN 99 Received: 21 JAN 99 Prepared: 24 JAN 99 Analyzed: 24 JAN 99 21 JAN 99

	Instrument:	GC/MS-MH	Dilution: 1.0	012. 22		ou. 21 o.m.,
-	Parameter		Result	Qualifier	RL	Units
-	Benzene		ND		0.50	ug/L
	Bromodichlorome	ethane	ND		1.0	ug/L
	Bromoform		ND		1.0	ug/L
	Bromomethane		ND		1.0	ug/L
	Carbon tetrachl	loride	ND		1.0	ug/L
	Chlorobenzene		ND		1.0	ug/L
	Chloroethane		ND		1.0	ug/L
معند	Chloroform		ND		1.0	ug/L
_	Chloromethane		ND		1.0	ug/L
	Dibromochlorome	thane	ND		1.0	ug/L
	1,2-Dichlorober	nzene	ND		1.0	ug/L
	1,3-Dichlorober	izene	ND		1.0	ug/L
	1,4-Dichlorober	izene	ND		1.0	ug/L
	1,1-Dichloroeth	nane	ND		1.0	ug/L
	1,2-Dichloroeth	nane	ND		1.0	ug/L
	1,1-Dichloroeth	nene	ND		1.0	ug/L
	trans-1,2-Dichl	oroethene	ND		1.0	ug/L
	1,2-Dichloropro	pane	ND		1.0	ug/L
هملتان	cis-1,3-Dichlor	copropene	ND		1.0	ug/L
•	trans-1,3-Dichl	.oropropene	ND		1.0	ug/L
	Ethylbenzene		5.8		1.0	ug/L
	Methylene chlor	ride	ND		1.0	ug/L
	1,1,2,2-Tetrach	loroethane	ND		1.0	ug/L
	Tetrachloroethe	ene	ND		1.0	ug/L
	Toluene		1.2		1.0	ug/L
	1,1,1-Trichlore		ND		1.0	ug/L
-	1,1,2-Trichlore	ethane	ND		1.0	ug/L
	Trichloroethene		7.1		1.0	ug/L
	Trichlorofluoro	methane	ND		1.0	ug/L
شخده	Vinyl chloride		ND		1.0	ug/L
_	Xylenes (total)		6.4		1.0	ug/L
	2-Chloroethyl v	vinyl ether	ND		1.0	ug/L
•	Surrogate		Recovery	7	Acceptable	e Range
	1,2-Dichloroeth	nane-d4	108	*	80 -	
	Toluene-d8		98	8	80 -	
-	Bromofluorobenz	ene	103	ક્ર	80 -	125

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW07-042
LAB ID: 135968-0005-SA

Matrix: AQUEOUS Sampled: 21 JAN 99 Received: 21 JAN 99 Authorized: 21 JAN 99 Prepared: 24 JAN 99 Analyzed: 24 JAN 99

	Auchorized.	ZI OM JJ	ricparca.		mary	ECG. 24 OAK
	Instrument:	GC/MS-MH	Dilution:	2.5		
	Parameter		Resi	ult Qualifie	er RL	Units
	Benzene		ND		1.2	ug/L
	Bromodichlorome	ethane	ND		2.5	ug/L
	Bromoform		ND		2.5	ug/L
40	Bromomethane		ND		2.5	ug/L
	Carbon tetrach	loride	ND		2.5	ug/L
	Chlorobenzene		ND		2.5	ug/L
	Chloroethane		ND		2.5	ug/L
	Chloroform		3.	. 0	2.5	ug/L
_	Chloromethane		ND		2.5	ug/L
	Dibromochlorome	ethane	ND		2.5	ug/L
	1,2-Dichlorober	nzene	ND		2.5	ug/L
	1,3-Dichlorober	nzene	ND		2.5	ug/L
	1,4-Dichlorober	izene	ND		2.5	ug/L
	1,1-Dichloroeth	nane	74		2.5	ug/L
	1,2-Dichloroeth	nane	24		2.5	ug/L
	1,1-Dichloroeth	nene	16		2.5	ug/L
	trans-1,2-Dichl	loroethene	5.	. 3	2.5	ug/L
	1,2-Dichloropro	pane	ND		2.5	ug/L
-	cis-1,3-Dichlor		ND		2.5	ug/L
_	trans-1,3-Dichl	loropropene	ND		2.5	ug/L
	Ethylbenzene		ND		2.5	ug/L
	Methylene chlor		ND		2.5	ug/L
	1,1,2,2-Tetrach		ND		2.5	ug/L
	Tetrachloroethe	ene	ND		2.5	ug/L
	Toluene		ND		2.5	ug/L
100/0	1,1,1-Trichlore		ND		2.5	ug/L
-	1,1,2-Trichlore		ND		2.5	ug/L
	Trichloroethene		160		2.5	ug/L
	Trichlorofluoro	omethane	ND		2.5	ug/L
	Vinyl chloride		ND		2.5	ug/L
	Xylenes (total)		ND		2.5	ug/L
	2-Chloroethyl v	vinyl ether	ND		2.5	ug/L
-	Surrogate		Reco	overy	Acceptab	le Range
	1,2-Dichloroeth	nane-d4	115			- 125
	Toluene-d8		97			- 125
	Bromofluorobenz	zene	103	8	80	- 125

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW04A-042
LAB ID: 135968-0006-SA
Matrix: AQUEOUS
Authorized: 21 JAN 99
Instrument: GC/MS-MH

Sampled: 21 JAN 99 Received: 21 JAN 99 Prepared: 24 JAN 99 Analyzed: 24 JAN 99

Dilution: 1.0

	Instrument:	GC/MS-MH	Diluti	on: 1.0)			
-	Parameter			Result	Qualifi	er	RL	Units
***	Benzene			ND		0	.50	ug/L
	Bromodichlorome	thane		ND		1	0	ug/L
	Bromoform			ND		1	0	ug/L
	Bromomethane			ND		1	0	ug/L
	Carbon tetrachle	oride		ND			0	ug/L
	Chlorobenzene			ND		1	0	ug/L
	Chloroethane			ND		1	0	ug/L
خسط	Chloroform			ND		1	0	ug/L
7,	Chloromethane			ND		1	0	ug/L
	Dibromochlorome	thane		ND		1	0	ug/L
	1,2-Dichloroben:	zene		ND		1	0	ug/L
	1,3-Dichloroben:	zene		ND		1	0	ug/L
	1,4-Dichloroben:	zene		ND		1	0	ug/L
	1,1-Dichloroetha	ane		7.3		1	0	ug/L
	1,2-Dichloroetha	ane		ND		1	0	ug/L
	1,1-Dichloroethe	ene		1.5		1	. 0	ug/L
	trans-1,2-Dichlo	oroethene		ND		1	0	ug/L
	1,2-Dichloroprop	pane		ND		1	. 0	ug/L
	cis-1,3-Dichlore	opropene		ND		1	. 0	ug/L
***	trans-1,3-Dichlo	propropene		ND			0	ug/L
	Ethylbenzene			ND		1	. 0	ug/L
	Methylene chlor:	ide		ND		1	. 0	ug/L
يفت	1,1,2,2-Tetrach	loroethane		ND		1	0	ug/L
	Tetrachloroether	ne		ND		1	0	ug/L
	Toluene			ND		1	. 0	ug/L
	1,1,1-Trichloroe	ethane		ND		1	. 0	ug/L
	1,1,2-Trichloro	ethane		ND		_	. 0	ug/L
	Trichloroethene			10		1	. 0	ug/L
	Trichlorofluoro	methane		ND		_	. 0	ug/L
Nellatura	Vinyl chloride			ND			. 0	ug/L
-	Xylenes (total)			ND			. 0	ug/L
	2-Chloroethyl v	inyl ether		ND		1	.0	ug/L
-	Surrogate			Recover	У	Acc	eptable	e Range
	1,2-Dichloroetha	ane-d4		94	ક		80 -	
	Toluene-d8			95	ક		80 -	
-	Bromofluorobenze	ene		104	8		80 -	125

Client Name: Phibro-Tech, Inc.
Client ID: PTI-EBO1-042
LAB ID: 135968-0007-EB
Matrix: AQUEOUS

Matrix: AQUEOUS Sampled: 21 JAN 99 Received: 21 JAN 99
Authorized: 21 JAN 99 Prepared: 24 JAN 99
Analyzed: 24 JAN 99

Authorized: Instrument:	21 JAN 99 GC/MS-MH	Prepared: 24 JAI Dilution: 1.0	N 99	Analyz	ed: 24 JAN 9
Parameter		Result Qı	ualifier	RL	Units
Benzene		ND		0.50	ug/L
Bromodichlorom	ethane	ND		1.0	ug/L
Bromoform		ND		1.0	ug/L
Bromomethane		ND		1.0	ug/L
Carbon tetrach	loride	ND		1.0	ug/L
Chlorobenzene		ND		1.0	ug/L
Chloroethane		ND		1.0	ug/L
Chloroform		ND		1.0	ug/L
Chloromethane		ND		1.0	ug/L
Dibromochlorom	ethane	ND		1.0	ug/L
1,2-Dichlorobe	nzene	ND		1.0	ug/L
1,3-Dichlorobe		ND		1.0	ug/L
1,4-Dichlorobe		ND		1.0	ug/L
1,1-Dichloroet		ND		1.0	ug/L
1,2-Dichloroet		ND		1.0	ug/L
1,1-Dichloroet		ND		1.0	ug/L
rans-1,2-Dich		ND		1.0	ug/L
1,2-Dichloropro		ND		1.0	ug/L
cis-1,3-Dichlo		ND		1.0	ug/L
trans-1,3-Dich		ND		1.0	ug/L
Ethylbenzene		ND		1.0	ug/L
Methylene chlo	ride	ND		1.0	ug/L
1,1,2,2-Tetrac		ND		1.0	ug/L
Tetrachloroeth		ND		1.0	ug/L
Toluene		ND		1.0	ug/L
1,1,1-Trichlore	pethane	ND		1.0	ug/L
1,1,2-Trichlore		ND		1.0	ug/L
Trichloroethen		ND		1.0	ug/L
Trichlorofluor		ND		1.0	ug/L
Vinyl chloride		ND		1.0	ug/L
Xylenes (total))	ND		1.0	ug/L
2-Chloroethyl		ND		1.0	ug/L
Surrogate		Recovery		Acceptable	e Range
1,2-Dichloroet	nane-d4	109	8	80 -	
Toluene-d8		100	용	80 -	125

Bromofluorobenzene

101 % 80 - 125

ND = Not Detected

Client Name: Phibro-Tech, Inc.
Client ID: PTI-TB02-042

LAB ID: 135968-0008-TB

Matrix: AQUEOUS Sampled: 21 JAN
Authorized: 21 JAN 99 Prepared: 24 JAN
Instrument: GC/MS-MH Dilution: 1.0 Sampled: 21 JAN 99 Received: 21 JAN 99 Prepared: 24 JAN 99 Analyzed: 24 JAN 99

Instrument:	GC/MS-MH	Dilution: 1.0)		
Parameter		Result	Qualifier	RL	Units
Benzene		ND		0.50	ug/L
Bromodichlorom	ethane	ND		1.0	ug/L
Bromoform		ND		1.0	ug/L
Bromomethane		ND		1.0	ug/L
Carbon tetrach	loride	ND		1.0	ug/L
Chlorobenzene		ND		1.0	ug/L
Chloroethane		ND		1.0	ug/L
Chloroform		ND		1.0	ug/L
Chloromethane		ND		1.0	ug/L
Dibromochlorom	ethane	ND		1.0	ug/L
1,2-Dichlorobe	nzene	ND		1.0	ug/L
1,3-Dichlorobe		ND		1.0	ug/L
1,4-Dichlorobe		ND		1.0	ug/L
1,1-Dichloroet		ND		1.0	ug/L
1,2-Dichloroet		ND		1.0	ug/L
1,1-Dichloroet		ND		1.0	ug/L
trans-1,2-Dich	loroethene	ND		1.0	ug/L
1,2-Dichloropr	opane	ND		1.0	ug/L
cis-1,3-Dichlo	ropropene	ND		1.0	ug/L
trans-1,3-Dich	loropropene	ND		1.0	ug/L
Ethylbenzene		ND		1.0	ug/L
Methylene chlo	ride	1.2		1.0	ug/L
1,1,2,2-Tetrac		ND		1.0	ug/L
Tetrachloroeth	ene	ND		1.0	ug/L
Toluene		ND		1.0	ug/L
1,1,1-Trichlor	oethane	ND		1.0	ug/L
1,1,2-Trichlor	oethane	ND		1.0	ug/L
Trichloroethen		ND		1.0	ug/L
Trichlorofluor		ND		1.0	ug/L
Vinyl chloride		ND		1.0	ug/L
Xylenes (total		ND		1.0	ug/L
2-Chloroethyl	vinyl ether	ND		1.0	ug/L
Surrogate		Recover	Y	Acceptabl	e Range
1,2-Dichloroet	hane-d4	102	8	80 -	125
Toluene-d8		102	*	80 -	
Bromofluoroben	zene	103	*	80 -	125

QC LOT ASSIGNMENT REPORT - MS QC Volatile Organics by GC/MS

	Laboratory Sample Number	QC Matrix	QC Category	QC Lot Number (DCS)	QC Run Number (SCS/BLANK/LCS)	MS QC Run Number (SA,MS,SD,DU)
	135968-0001-SA	AQUEOUS	Q8260-A		24 JAN 99-AHX	24 JAN 99-AH
	135968-0002-SA	AQUEOUS	Q8260-A		24 JAN 99-AHX	24 JAN 99-AH
	135968-0003 <i>-S</i> A	AQUEOUS	Q8260-A		24 JAN 99-AHX	24 JAN 99-AH
	135968-0004-SA	AQUEOUS	Q8260-A		24 JAN 99-AHX	24 JAN 99-AH
	135968-0005-SA	AQUEOUS	Q8260-A		24 JAN 99-AHX	24 JAN 99-AH
-	135968-0006-SA	AQUEOUS	Q8260-A		24 JAN 99-AHX	24 JAN 99-AH
_	135968-0007-EB	AQUEOUS	Q8260-A		24 JAN 99-AHX	24 JAN 99-AH
	135968-0008-TB	AQUEOUS	Q8260-A		24 JAN 99-AHX	24 JAN 99-AH

METHOD BLANK REPORT

Volatile Organics by GC/MS

Project: 135968

Test: Q8260-DW-AP Method SW8260B - Volatile Organics - 25 mL Matrix: AQUEOUS QC Run: 24 JAN 99-AHX Date Ar Date Analyzed: 24 JAN 99

			Reporting	
Analyte	Result	Units	Limit	
Benzene	ND	ug/L	0.50	
Bromodichloromethane	ND	ug/L	1.0	
Bromoform	ND	ug/L	1.0	
Bromomethane	ND	ug/L	1.0	
Carbon tetrachloride	ND	ug/L	1.0	
Chlorobenzene	ND	ug/L	1.0	
Chloroethane	ND	ug/L	1.0	
Chloroform	ND	ug/L	1.0	
Chloromethane	ND	ug/L	1.0	
Dibromochloromethane	ND	ug/L	1.0	
1,2-Dichlorobenzene	ND	ug/L	1.0	
1,3-Dichlorobenzene	ND	ug/L	1.0	
1,4-Dichlorobenzene	ND	ug/L	1.0	
1,1-Dichloroethane	ND	ug/L	1.0	
1,2-Dichloroethane	ND	ug/L	1.0	
1,1-Dichloroethene	ND	ug/L	1.0	
trans-1,2-Dichloroethene	ND	ug/L	1.0	
1,2-Dichloropropane	ND	ug/L	1.0	
cis-1,3-Dichloropropene	ND	ug/L	1.0	
trans-1,3-Dichloropropene	ND	ug/L	1.0	
Ethylbenzene	ND	ug/L	1.0	
Methylene chloride	ND	ug/L	1.0	
1,1,2,2-Tetrachloroethane	N D	ug/L	1.0	
Tetrachloroethene	ND	ug/L	1.0	
Toluene	ND	ug/L	1.0	
1,1,1-Trichloroethane	ND	ug/L	1.0	
1,1,2-Trichloroethane	ND	ug/L	1.0	
Trichloroethene	ND	ug/L	1.0	
Trichlorofluoromethane	ND	ug/L	1.0	
Vinyl chloride	ND	ug/L	1.0	
Xylenes (total)	ND	ug/L	1.0	
2-Chloroethyl vinyl ether	ND	ug/L	1.0	
Surrogate	Recovery	Acceptable	e Range	
1 2-Dichloroethane-d4	1.01	80 -125		

Surrogate	Recovery	Acceptable Range
1,2-Dichloroethane-d4	101	80 -125
Toluene-d8	104	80 -125
Bromofluorobenzene	102	80 -125

LABORATORY CONTROL SAMPLE REPORT

Volatile Organics by GC/MS

Project: 135968

Category: Q8260-A Method SW8260B - Volatile Organics

Matrix: AQUEOUS Date Analyzed: 24 JAN 99 QC Run: 24 JAN 99-AHX

Concentration Units: ug/L

-	3, -	Conce	ntration	Accus	Accuracy(%)				
	Analyte	Spiked	Measured	LCS	Limits				
***	1,1-Dichloroethene	10.0	9.26	93	70-135				
	Trichloroethene	10.0	10.0	100	70-130				
	Benzene	10.0	9.75	98	80-120				
	Toluene	10.0	9.63	96	80-120				
	Chlorobenzene	10.0	9.89	99	80-120				
		Conce	ntration	Accuracy(%)					
	Surrogates	Spiked	Measured	LCS	Limits				
	1,2-Dichloroethane-d4	10.0	10.1	101	80-125				
	Bromofluorobenzene	10.0	10.6	106	80-125				
	Toluene-d8	10.0	10.4	104	80-125				

Calculations are performed before rounding to avoid round-off errors in calculated results.

■ MATRIX SPIKE/MATRIX SPIKE DUPLICATE QC REPORT

Volatile Organics by GC/MS

Project: 135968

Category: Q8260-A Method SW8260B - Volatile Organics

Matrix: AQUEOUS Sample: 135968-0006 MS Run: 24 JAN 99-AH

Units: ug/L

		Conc	centration				
Analyte	Sample Result	MS Result	MSD Result	Amount Spiked MS/MSD	%Recovery MS MSD	%RPD	Acceptance Limit Recov. RPD
1,1-Dichloroethene	1.51	11.1	10.6	10.0	96 91	4.6	70-135 25
Trichloroethene	10.0	20.1	20.0	10.0	100 99	0.7	70~130 25
Benzene	ND	9.96	9.62	10.0	100 96	3.5	80-120 25
Toluene	ND	10.1	9.92	10.0	101 99	1.4	80-120 25
Chlorobenzene	ND	10.4	10.2	10.0	104 102	1.9	80-120 25
	Sample			%Rec	overy	Acce	eptance Limit
Surrogates	%Recovery			MS	MSD		Recovery
1,2-Dichloroethane-d4	94			120	113		80-125
Bromofluorobenzene	104			111	110		80-125
Toluene-d8	95			100	100		80-125

N = Not Detected

Calculations are performed before rounding to avoid round-off errors in calculated results.

Metals

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW03-042
LAB ID: 135968-0001-SA
Matrix: AQUEOUS
Authorized: 21 JAN 99

Sampled: 21 JAN 99

Received: 21 JAN 99

Prepared: See Below

Analyzed: See Below

•	Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
_	Cadmium	ND	1.0	0.0050	- .	6010B	26 JAN 99	
	Chromium	ND	1.0	0.010	mg/L	6010B	26 JAN 99	27 JAN 99
	Copper	ND	1.0	0.020	mg/L	6010B	26 JAN 99	27 JAN 99

Client Name: Phibro-Tech, Inc.

Client ID: PTI-MW11-042
LAB ID: 135968-0002-SA
Matrix: AQUEOUS
Authorized: 21 JAN 99

Sampled: 21 JAN 99 Prepared: See Below Received: 21 JAN 99 Analyzed: See Below

	Parameter	Result Qual	DIL	RL	Units	Method	Prep Date		Anal Da	lyzed ate	ì
-	Cadmium Chromium	ND ND	1.0	0.0050 0.010	mg/L mg/L	6010B 6010B	26 JAN 26 JAN			JAN JAN	
	Copper	ND	1.0	0.020	mg/L	6010B	26 JAN	99	27	JAN	99

Sampled: 21 JAN 99 Received: 21 JAN 99 Prepared: See Below Analyzed: See Below

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW06B-042
LAB ID: 135968-0003-SA
Matrix: AQUEOUS
Authorized: 21 JAN 99

	Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
•	Cadmium	ND	1.0	0.0050	mg/L	6010B	26 JAN 99	27 JAN 99
	Chromium	ND	1.0	0.010	mg/L	6010B	26 JAN 99	27 JAN 99
	Copper	ND	1.0	0.020	mg/L	6010B	26 JAN 99	27 JAN 99

Client Name: Phibro-Tech, Inc. Client ID: PTI-MW06D-042

LAB ID:

135968-0004-SA

AQUEOUS

Sampled: 21 JAN 99 Received: 21 JAN 99 Prepared: See Below Analyzed: See Below

Authorized: 21 JAN 99

	Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
-	Cadmium	ND		0.0050	<u> </u>		26 JAN 99	
_	Chromium	ND	1.0	0.010	mg/L	6010B	26 JAN 99	27 JAN 99
	Copper	ND	1.0	0.020	mg/L	6010B	26 JAN 99	27 JAN 99

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW07-042
LAB ID: 135968-0005-SA

LAB ID: Matrix:

AQUEOUS

Authorized: 21 JAN 99

Sampled: 21 JAN 99 Prepared: See Below

Received: 21 JAN 99 Analyzed: See Below

-	Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
-	Cadmium Chromium	0.0056 ND	1.0	0.0050	mg/L mg/L	6010B 6010B	26 JAN 99 26 JAN 99	
	Copper	0.050	1.0	0.020	mg/L	6010B	26 JAN 99	27 JAN 99

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW04A-042
LAB ID: 135968-0006-SA
Matrix: AQUEOUS
Authorized: 21 JAN 99

Matrix: AQUEOUS Sampled: 21 JAN 99 Received: 21 JAN 99 Authorized: 21 JAN 99 Prepared: See Below Analyzed: See Below

-	Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
	Cadmium	ND	1.0	0.0050		6010B	26 JAN 99	
	Chromium Copper	0.025 ND	1.0	0.010 0.020	mg/L mg/L	6010B 6010B	26 JAN 99 26 JAN 99	

Result Qual DIL RL Units Method

Client Name: Phibro-Tech, Inc. Client ID: PTI-EBO1-042 Client ID:

LAB ID: Matrix:

135968-0007-EB

AQUEOUS

Sampled: 21 JAN 99 Received: 21 JAN 99 Prepared: See Below Analyzed: See Below

Authorized: 21 JAN 99

ND

ND

ND

Parameter	

Prep Analyzed Date Date 27 JAN 99

Cadmium	
Chromium	
Copper	

1.0	0.0050	mg/L	6010B	26	JAN	99	27	JAN	99
1.0	0.010	mg/L	6010B	26	JAN	99	27	JAN	99
1.0	0.020	mg/L	6010B	26	JAN	99	27	JAN	99

QC LOT ASSIGNMENT REPORT - MS QC Metals Analysis and Preparation

Laboratory QC Lot Number QC Run N Sample Number QC Matrix QC Category (DCS) (SCS/BLAN	K/LCS) (SA,MS,SD,DU)
135968-0001-SA AQUEOUS QICP-A 26 JAN 9 135968-0002-SA AQUEOUS QICP-A 26 JAN 9 135968-0003-SA AQUEOUS QICP-A 26 JAN 9 135968-0004-SA AQUEOUS QICP-A 26 JAN 9 135968-0005-SA AQUEOUS QICP-A 26 JAN 9 135968-0006-SA AQUEOUS QICP-A 26 JAN 9 135968-0007-EB AQUEOUS QICP-A 26 JAN 9	9-AX 26 JAN 99-AA 9-AX 26 JAN 99-AA 9-AX 26 JAN 99-AA 9-AX 26 JAN 99-AA 9-AX 26 JAN 99-AA

METHOD BLANK REPORT

Metals Analysis and Preparation

Project: 135968

Method 6010B - ICP Metals

Test: Q-ICP-AR
Matrix: AQUEOUS
QC Run: 26 JAN 99-AX Date Analyzed: 26 JAN 99

Reporting

Analyte	Result	Units	Limit
Cadmium	ND	mg/L	0.0050
Chromium	ND	mg/L	0.010
Copper	ND	mg/L	0.020

LABORATORY CONTROL SAMPLE REPORT Metals Analysis and Preparation

Project: 135968

Category: QICP-A Method 6010B - ICP Metals

Matrix: AQUEOUS Date Analyzed: 26 JAN 99

Matrix: AQUEOUS
QC Run: 26 JAN 99-AX
Concentration Units: mg/L

	Concer	Concentration				
Analyte	Spiked	Measured	LCS	Limits		
Cadmium	0.0500	0.0544	109	80-120		
Chromium	0.200	0.209	105	80-115		
Copper	0.250	0.260	104	85-115		

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE QC REPORT

Metals Analysis and Preparation

Project: 135968

Category: QICP-A Method 6010B - ICP Metals

Matrix: AQUEOUS
Sample: 135968-0001
MS Run: 26 JAN 99-AA
Units: mg/L

		Concentration						
•	Sample	MS	MSD	Amount Spiked	%Recov	ery %RPD	Acceptance Limit	
Analyte	Result	Result	Result	MS/MSD	MS M	SD	Recov.	RPD
Cadmium	ND	0.0515	0.0526	0.0500	103	105 2.1	80-120	20
Chromium	ND	0.206	0.198	0.200	103	99 4.1	80-115	20
Copper	0.0140 J	0.274	0.275	0.250	104	104 0.2	85-115	20

J = Result is detected below the reporting limit or is an estimated concentration.) = Not Detected

Calculations are performed before rounding to avoid round-off errors in calculated results.

General Chemistry

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW03-042
LAB ID: 135968-0001-SA
Matrix: AQUEOUS
Authorized: 21 JAN 99

Sampled: 21 JAN 99 Received: 21 JAN 99 Prepared: See Below Analyzed: See Below

••• I	Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
C	Chromium, Hexavalent	ND	1.0	0.020	mg/L	SW7196	NA	21 JAN 99
	DH	7 2	1.0	NA	units	SW9040	NA	21 JAN 99

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW11-042
LAB ID: 135968-0002-SA
Matrix: AQUEOUS

Sampled: 21 JAN 99 Prepared: See Below

Received: 21 JAN 99

Authorized: 21 JAN 99

Analyzed: See Below

-	Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
	Chromium,							
and in con-	Hexavalent	ND	1.0	0.020	mg/L	SW7196	NA	21 J AN 99
-	nH	6.8	1.0	NA	units	SW9040	NA	21 JAN 99

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW06B-042
LAB ID: 135968-0003-SA
Matrix: AQUEOUS
Authorized: 21 JAN 99

Sampled: 21 JAN 99 Received: 21 JAN 99 Prepared: See Below Analyzed: See Below

	Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
	Chromium,				/ -	ONE 106	373	21 733 00
	Hexavalent	ND	1.0	0.020	mg/L	SW7196	NA	21 JAN 99
-	pН	7.2	1.0	NA	units	SW9040	NA	21 JAN 99

Client Name: Phibro-Tech, Inc.

Client ID:

PTI-MW06D-042

LAB ID:

135968-0004-SA

Matrix:

AQUEOUS

Sampled: 21 JAN 99

Received: 21 JAN 99

Authorized:

21 JAN 99

Prepared: See Below

Analyzed: See Below

-	Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
	Chromium, Hexavalent	ND	1.0	0.020	mq/L	SW7196	NA	21 JAN 99
-	немачитель	7.5	1.0	NA	units	SW9040	NA	21 JAN 99

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW07-042

LAB ID: 135968-0005-SA

Matrix: AQUEOUS Sampled: 21 JAN 99 Received: 21 JAN 99
Authorized: 21 JAN 99 Prepared: See Below Analyzed: See Below

Prep Analyzed
Parameter Result Qual DIL RL Units Method Date Date

Chromium,
Hexavalent ND 1.0 0.020 mg/L SW7196 NA 21 JAN 9

Hexavalent ND 1.0 0.020 mg/L SW7196 NA 21 JAN 99 pH 6.5 1.0 NA units SW9040 NA 21 JAN 99

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW04A-042
LAB ID: 135968-0006-SA
Matrix: AQUEOUS
Authorized: 21 JAN 99

Sampled: 21 JAN 99 Received: 21 JAN 99 Prepared: See Below Analyzed: See Below

•	Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
•	Chromium, Hexavalent pH	0.020 7.8	1.0	0.020 NA	mg/L units	SW7196 SW9040	NA NA	21 JAN 99 21 JAN 99

Client ID:

Client Name: Phibro-Tech, Inc.

LAB ID:

PTI-EB01-042

Matrix:

135968-0007-EB

Authorized:

AQUEOUS 21 JAN 99

ND

Sampled: 21 JAN 99 Prepared: See Below Received: 21 JAN 99

Prep

Date

NA

NA

Result Qual DIL

Analyzed: See Below

Parameter Chromium,

Hexavalent

1.0

 $0.020~{
m mg/L}$

RL Units

SW7196

Method

21 JAN 99

Analyzed

Date

pН

7.8

1.0

NA units SW9040

21 JAN 99

QC LOT ASSIGNMENT REPORT - MS QC
Wet Chemistry Analysis and Preparation

	Laboratory Sample Number	QC Matrix	QC Category	QC Lot Number (DCS)	QC Run Number (SCS/BLANK/LCS)	MS QC Run Number (SA,MS,SD,DU)
•	135968-0001-SA 135968-0002-SA 135968-0003-SA 135968-0004-SA	AQUEOUS AQUEOUS AQUEOUS AQUEOUS	QCR6-A QCR6-A QCR6-A QCR6-A		21 JAN 99-AX 21 JAN 99-AX 21 JAN 99-AX 21 JAN 99-AX	21 JAN 99-AA 21 JAN 99-AA 21 JAN 99-AA 21 JAN 99-AA
-	135968-0005-SA 135968-0006-SA 135968-0007-EB	AQUEOUS AQUEOUS AQUEOUS	QCR6-A QCR6-A QCR6-A		21 JAN 99-AX 21 JAN 99-AX 21 JAN 99-AX	21 JAN 99-AA 21 JAN 99-AA 21 JAN 99-AA

METHOD BLANK REPORT

Wet Chemistry Analysis and Preparation

Project: 135968

Test: Q-CR6-A

Method SW7196A - Chromium, Hexavalent

Matrix: AQUEOUS

QC Run: 21 JAN 99-AX

Date Analyzed: 21 JAN 99

Reporting

Analyte Result

Limit

Chromium, Hexavalent

ND

mg/L

Units

0.020

LABORATORY CONTROL SAMPLE REPORT

Wet Chemistry Analysis and Preparation

Project: 135968

Category: QCR6-A Method 7196 - Chromium, Hexavalent

Matrix: AQUEOUS Date Analyzed: 21 JAN 99

QC Run: 21 JAN 99-AX

Concentration Units: mg/L

Concentration Accuracy(%)
Analyte Spiked Measured LCS Limits

Chromium, Hexavalent 0.0500 0.0527 105 85-115

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE QC REPORT

Wet Chemistry Analysis and Preparation

Project: 135968

Category: QCR6-A Method 7196 - Chromium, Hexavalent

Matrix: AQUEOUS
Sample: 135968-0001

MS Run: 21 JAN 99-AA

Units: mg/L

Concentration

The same to							7				
	Sample	MS	MSD	- .	%Recovery	%RPD	Accepta: Limi				
Analyte	Result	Result	Result	MS/MSD	MS MSD		Recov.	RPD			
Chromium, Hexavalent	ND	0.0471	0.0482	0.0500	94 9	6 2.3	85-115	20			

D = Not Detected

Calculations are performed before rounding to avoid round-off errors in calculated results.

QC LOT ASSIGNMENT REPORT - MS QC GC/MS Preparation

Laboratory			QC Lot Number	QC Run Number	MS QC Run Number
Sample Number	QC Matrix	QC Category	(DCS)	(SCS/BLANK/LCS)	(SA,MS,SD,DU)
135968-0001-SA	AOUEOUS	PH-A		21 JAN 99-AX	21 JAN 99-AA
135968-0002-SA	AQUEOUS	PH-A		21 JAN 99-AX	21 JAN 99-AA
135968-0003-SA	AQUEOUS	PH-A		21 JAN 99-AX	21 JAN 99-AA
135968-0004-SA	AQUEOUS	PH-A		21 JAN 99-AX	21 JAN 99-AA
135968-0005-SA	AQUEOUS	PH-A		21 JAN 99-AX	21 JAN 99-AA
135968-0006-SA	AQUEOUS	PH-A		21 JAN 99-AX	21 JAN 99-AA
135968-0007-EB	AQUEOUS	PH-A		21 JAN 99-AX	21 JAN 99-AA

MATRIX DUPLICATE QC REPORT

GC/MS Preparation Project: 135968

Category: PH-A

pH for Aqueous Samples

Matrix: AQUEOUS Sample: 135968-0001 MS Run: 21 JAN 99-AA

Units: units

Concentration

	Analyte	Sample	Duplicate	%RPD SA-DU	Acceptance Limit
-	рН	7.18	7.15	0.42	30

Calculations are performed before rounding to avoid round-off errors in calculated results.

7			
Section 1			
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Quanterra Incorporated 1721 South Grand Avenue Santa Ana, California 92705

714 258-8610 Telephone 714 258-0921 Fax

February 05, 1999

QUANTERRA INCORPORATED PROJECT NUMBER: 135976 PO/CONTRACT: 2000 PTI Quarterly Wastewater

Ed Vigil Phibro-Tech, Inc. 8851 Dice Road Santa Fe Springs, CA 90670

Dear Mr. Vigil,

This report contains the analytical results for the ten samples received under chain of custody by Quanterra Incorporated on January 22, 1999. These samples are associated with your Wastewater project.

The case narrative is an integral part of this report.

po3 60x

If you have any questions, please feel free to call me at (714) 258-8610.

Sincerely,

Diane Suzuki

Project Manager

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General Chemistry Sample Data Sheets Method Blank Reports Laboratory QC Reports

CASE NARRATIVE

QUANTERRA INCORPORATED PROJECT NUMBER 135976

All applicable internal quality control analyses including calibrations and calibration verifications, calibration (instrument) and method blanks, laboratory control samples (LCS), matrix spikes (MS) and matrix spike duplicates (MSD), and other QC met project-specified acceptance criteria. Any matrix-related anomalies are indicated using footnotes within the report. Any other anomalies are reported within the narrative.

There were no anomalies associated with this project.

Quanterra Environmental Services - Western Region Quality Control Definitions

QC Parameter	Definition
QC Batch	A set of up to 20 field samples plus associated laboratory QC samples that are similar in composition (matrix) and that are processed within the same time period with the same reagent and standard lots.
Duplicate Control Sample (DCS)	Consist of a pair of LCSs analyzed within the same QC batch to monitor precision and accuracy independent of sample matrix effects. This QC is performed only if required by client or when insufficient sample is available to perform MS/MSD.
Duplicate Sample (DU)	A second aliquot of an environmental sample, taken from the same sample container when possible, that is processed independently with the first sample aliquot. The results are used to assess the effect of the sample matrix on the precision of the analytical process. The precision estimated using this sample is not necessarily representative of the precision for other samples in the batch.
Laboratory Control Sample (LCS)	A volume of reagent water for aqueous samples or a contaminant-free solid matrix (Ottawa sand) for soil and sediment samples which is spiked with known amounts of representative target analytes and required surrogates. An LCS is carried through the entire analytical process and is used to monitor the accuracy of the analytical process independent of potential matrix effects.
Matrix Spike and Matrix Spike Duplicate (MS/MSD)	A field sample fortified with known quantities of target analytes that are also added to the LCS. Matrix spike duplicate is a second matrix spike sample. MSs/MSDs are carried through the entire analytical process and are used to determine sample matrix effect on accuracy of the measurement system. The accuracy and precision estimated using MS/MSD is only representative of the precision of the sample that was spiked.
Method Blank (MB)	A sample composed of all the reagents (in the same quantities) in reagent water carried through the entire analytical process. The method blank is used to monitor the level of contamination introduced during sample preparation steps.
Surrogate Spike	Organic constituents not expected to be detected in environmental media and are added to every sample and QC at a known concentration. Surrogates are used to determine the efficiency of the sample preparation and the analytical process.

Source: Quanterra® Quality Control Program, Policy QA-003, Rev. 0, 8/19/96.

SAMPLE DESCRIPTION INFORMATION for Phibro-Tech, Inc.

منفنت					San	np1e	ed	Red	ceive	ed
_	Lab ID	Client ID	Matrix	3	Date		Time	I	Date	
	135976-0001-SA	PTI-MW04-042	AQUEOUS	22	JAN	99	09:30	22	JAN	99
-	135976-0002-SA	PTI-MW14S-042	AQUEOUS	22	JAN	99	10:45	22	JAN	99
	135976-0003-SA	PTI-MW15S-042	AQUEOUS	22	JAN	99	11:45	22	JAN	99
	135976-0004-SA	PTI-MW15D-042	AQUEOUS	22	JAN	99	12:40	22	JAN	99
	135976-0005-SA	PTI-MW16-042	AQUEOUS	22	JAN	99	14:15	22	JAN	99
	135976-0006-SA	PTI-MW35-042 ↔ Ø∪₽	AQUEOUS	22	JAN	99	09:40	22	JAN	99
	135976-0007-SA	PTI-MW37-042-16 DUP	AQUEOUS	22	JAN	99	15:00	22	JAN	99
	135976-0008-SA	PTI-MW09-042	AQUEOUS	22	JAN	99	15:50	22	JAN	99
1000	135976-0009-EB	PTI-EB02-042	AQUEOUS	22	JAN	99	14:40	22	JAN	99
_	135976-0010-TB	PTI-TB03-042	AQUEOUS	22	JAN	99		22	JAN	99

Volatiles

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW04-042
LAB ID: 135976-0001-SA LAB ID: Matrix: 135976-0001-SA

Matrix: AQUEOUS Sampled: 22 d Authorized: 22 JAN 99 Prepared: 26 Instrument: GC/MS-MH Dilution: 10 AQUEOUS Sampled: 22 JAN 99 Prepared: 26 JAN 99 Received: 22 JAN 99 Analyzed: 26 JAN 99

institutent: GC/M5-MA	Dilucion: 10		
Parameter	Result	Qualifier R	L Units
Benzene	ND	5.0	ug/L
Bromodichloromethane	ND	10	ug/L
Bromoform	ND	10	ug/L
Bromomethane	ND	10	ug/L
Carbon tetrachloride	ND	10	ug/L
Chlorobenzene	ND	10	ug/L
Chloroethane	ND	10	ug/L
Chloroform	35	10	ug/L
Chloromethane	ND	10	ug/L
Dibromochloromethane	ND	10	ug/L
1,2-Dichlorobenzene	ND	10	ug/L
1,3-Dichlorobenzene	ND	10	ug/L
1,4-Dichlorobenzene	ND	10	ug/L
1,1-Dichloroethane	140	10	ug/L
1,2-Dichloroethane	33	10	ug/L
1,1-Dichloroethene	60	10	ug/L
trans-1,2-Dichloroethene	ND	10	ug/L
1,2-Dichloropropane	ND	10	ug/L
cis-1,3-Dichloropropene	ND	10	ug/L
trans-1,3-Dichloropropene	ND	10	ug/L
Ethylbenzene	520	10	ug/L
Methylene chloride	140	10	ug/L
1,1,2,2-Tetrachloroethane	ND	10	ug/L
Tetrachloroethene	ND	10	ug/L
Toluene	ND	10	ug/L
1,1,1-Trichloroethane	ND	10	ug/L
1,1,2-Trichloroethane	ND	10	ug/L
Trichloroethene	260	10	ug/L
Trichlorofluoromethane	ND	10	ug/L
Vinyl chloride	ND	10	ug/L
Xylenes (total)	31	10	ug/L
2-Chloroethyl vinyl ether	ND	10	ug/L
Surrogate	Recover	y Accepta	able Range
1,2-Dichloroethane-d4	113	* 80	0 - 125
Toluene-d8	104	% 80	0 - 125
Bromofluorobenzene	104	* 80	0 - 125

ND = Not Detected

Client Name: Phibro-Tech, Inc. Client ID: PTI-MW14S-042 LAB ID: 135976-0002-SA

Matrix: AQUEOUS
Authorized: 22 JAN 99
Instrument: GC/MS-MH Sampled: 22 JAN 99 Received: 22 JAN 99 Prepared: 26 JAN 99 Dilution: 2.0 Analyzed: 26 JAN 99

	Instrument:	GC/MS-MH	Dilution:	2.0			
	Parameter		Resu	lt Qual	lifier	RL	Units
-	Benzene		1.	1		1.0	ug/L
	Bromodichlorome	thane	ND			2.0	ug/L
	Bromoform		ND			2.0	ug/L
	Bromomethane		ND			2.0	ug/L
	Carbon tetrachl	oride	31			2.0	ug/L
	Chlorobenzene		ND			2.0	ug/L
	Chloroethane		ND			2.0	ug/L
cima	Chloroform		23			2.0	ug/L
•	Chloromethane		ND			2.0	ug/L
	Dibromochlorome	thane	ND			2.0	ug/L
	1,2-Dichloroben	zene	ND			2.0	ug/L
-	1,3-Dichloroben	zene	ND			2.0	ug/L
	1,4-Dichloroben	zene	ND			2.0	ug/L
	1,1-Dichloroeth	ane	.27			2.0	ug/L
	1,2-Dichloroeth	ane	5.	6		2.0	ug/L
-	1,1-Dichloroeth	ene	21			2.0	ug/L
	trans-1,2-Dichl	oroethene	ND			2.0	ug/L
	1,2-Dichloropro		ND			2.0	ug/L
2.12	cis-1,3-Dichlor	opropene	ND			2.0	ug/L
	trans-1,3-Dichl	oropropene	ND			2.0	ug/L
	Ethylbenzene		77			2.0	ug/L
	Methylene chlor	ride	2.	6		2.0	ug/L
فننفذ	1,1,2,2-Tetrach	loroethane	ND			2.0	ug/L
_	Tetrachloroethe	ne	ND			2.0	ug/L
	Toluene		ND			2.0	ug/L
	1,1,1-Trichloro	ethane	ND			2.0	ug/L
	1,1,2-Trichloro	ethane	ND			2.0	ug/L
	Trichloroethene	:	98			2.0	$\mathtt{ug/L}$
	Trichlorofluoro	methane	ND			2.0	ug/L
	Vinyl chloride		ND			2.0	ug/L
	Xylenes (total)		64			2.0	ug/L
	2-Chloroethyl v	rinyl ether	ND			2.0	ug/L
-	Surrogate		Reco	very		Acceptable	e Range
	1,2-Dichloroeth	ane-d4	89		8	80 -	
	Toluene-d8		99		ક	80 -	
***	Bromofluorobenz	ene	100		8	80 -	125

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW15S-042

LAB ID: 135976-0003-SA
Matrix: AQUEOUS Sampled: 22 JA
Authorized: 22 JAN 99 Prepared: 26 J
Instrument: GC/MS-MH Dilution: 1.0 Sampled: 22 JAN 99 Received: 22 JAN 99 Prepared: 26 JAN 99 Analyzed: 26 JAN 99

Instrument: GC/MS-MH	Dilution: 1.0	
Parameter	Result Qualif	fier RL Units
Benzene	ND	0.50 ug/L
Bromodichloromethane	ND	1.0 ug/L
Bromoform	ND	1.0 ug/L
Bromomethane	ND	1.0 ug/L
Carbon tetrachloride	4.4	1.0 ug/L
Chlorobenzene	ND	1.0 ug/L
Chloroethane	ND	1.0 ug/L
Chloroform	4.4	1.0 ug/L
Chloromethane	ND	1.0 ug/L
Dibromochloromethane	ND	1.0 ug/L
1,2-Dichlorobenzene	ND	1.0 ug/L
1,3-Dichlorobenzene	ND	1.0 ug/L
1,4-Dichlorobenzene	ND	1.0 ug/L
1,1-Dichloroethane	ND	1.0 ug/L
1,2-Dichloroethane	1.7	1.0 ug/L
1,1-Dichloroethene	ND	1.0 ug/L
trans-1,2-Dichloroethene	ND	1.0 ug/L
1,2-Dichloropropane	ND	1.0 ug/L
cis-1,3-Dichloropropene	ND	1.0 ug/L
trans-1,3-Dichloropropene	ND	1.0 ug/L
Ethylbenzene	19	1.0 ug/L
Methylene chloride	ND	1.0 ug/L
1,1,2,2-Tetrachloroethane	ND	1.0 ug/L
Tetrachloroethene	1.1	1.0 ug/L
Toluene	ND	1.0 ug/L
1,1,1-Trichloroethane	ND	1.0 ug/L
1,1,2-Trichloroethane	ND	1.0 ug/L
Trichloroethene	7.0	1.0 ug/L
Trichlorofluoromethane	ND	1.0 ug/L
Vinyl chloride	ND	1.0 ug/L
Xylenes (total)	2.2	1.0 ug/L
2-Chloroethyl vinyl ether	ND	1.0 ug/L
Surrogate	Recovery	Acceptable Range
1,2-Dichloroethane-d4	115	% 80 - 125
Toluene-d8	103	% 80 - 125
Bromofluorobenzene	105	% 80 - 125

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW15D-042
LAB ID: 135976-0004-SA
Matrix: AQUEOUS
Authorized: 22 JAN 99
Instrument: GC/MS-MH

Sampled: 22 JAN 99
Prepared: 26 JAN 99
Dilution: 1.0

Received: 22 JAN 99
Analyzed: 26 JAN 99

Instrument: GC/MS-MH	Dilution: 1.0		
Parameter	Result Qualifier	RL	Units
Benzene	ND	0.50	ug/L
Bromodichloromethane	ND	1.0	ug/L
Bromoform	ND	1.0	ug/L
Bromomethane	ND	1.0	ug/L
Carbon tetrachloride	ND	1.0	ug/L
Chlorobenzene	ND	1.0	ug/L
Chloroethane	ND	1.0	ug/L
Chloroform	ND	1.0	ug/L
Chloromethane	ND	1.0	ug/L
Dibromochloromethane	ND	1.0	ug/L
1,2-Dichlorobenzene	ND	1.0	ug/L
1,3-Dichlorobenzene	ND	1.0	ug/L
1,4-Dichlorobenzene	ND	1.0	ug/L
1,1-Dichloroethane	ND	1.0	ug/L
1,2-Dichloroethane	ND	1.0	ug/L
1,1-Dichloroethene	ND	1.0	ug/L
trans-1,2-Dichloroethene	ND	1.0	ug/L
1,2-Dichloropropane	ND	1.0	ug/L
cis-1,3-Dichloropropene	ND	1.0	ug/L
trans-1,3-Dichloropropene	ND	1.0	ug/L
Ethylbenzene	15	1.0	ug/L
Methylene chloride	ND	1.0	ug/L
1,1,2,2-Tetrachloroethane	ND	1.0	ug/L
Tetrachloroethene	1.0	1.0	ug/L
Toluene	ND	1.0	ug/L
1,1,1-Trichloroethane	ND	1.0	ug/L
1,1,2-Trichloroethane	ND	1.0	ug/L
Trichloroethene	5.4	1.0	ug/L
Trichlorofluoromethane	ND	1.0	ug/L
Vinyl chloride	ND	1.0	ug/L
Xylenes (total)	2.1	1.0	ug/L
2-Chloroethyl vinyl ether	ND	1.0	ug/L
Surrogate	Recovery	Acceptabl	e Range
1,2-Dichloroethane-d4	106 %	80 -	125
Toluene-d8	99 %	80 -	125
Bromofluorobenzene	99 %	80 -	125

Client Name: Phibro-Tech, Inc. Client ID: PTI-MW16-042 LAB ID: 135976-0005-SA

Sampled: 22 JAN 99 Received: 22 JAN 99 Matrix: AQUEOUS Prepared: 26 JAN 99 22 JAN 99 Analyzed: 26 JAN 99 Authorized: 22 JAN 99
Instrument: GC/MS-MC

Dilution: 2.0

	Instrument: GC/MS-MC	Dilution: 2.0	1	
	Parameter	Result	Qualifier	RL Units
	P	\mathrew (1)		0
_	Benzene	ND	1. 2.	J.
	Bromodichloromethane	ND		3 .
	Bromoform	ND	2.	٥.
مست	Bromomethane	ND	2.	-
_	Carbon tetrachloride	ND	2.	-
	Chlorobenzene	ND	2.	3 .
	Chloroethane	ND 	2.	3 .
	Chloroform	ND	2.	
	Chloromethane	ND	2.	3 -
	Dibromochloromethane	ND	2.	3 .
	1,2-Dichlorobenzene	ND	2.	3 -
	1,3-Dichlorobenzene	ND	2.	J.,
	1,4-Dichlorobenzene	ND	2.	3 ,
	1,1-Dichloroethane	170	2.	- .
Statement	1,2-Dichloroethane	41	2.	-
-	1,1-Dichloroethene	17	2.	- J /
	trans-1,2-Dichloroethene	4.6	2.	- .
	1,2-Dichloropropane	ND	2.	2
-	cis-1,3-Dichloropropene	ND	2.	•
_	trans-1,3-Dichloropropene	ND	2.	J.
	Ethylbenzene	11	2.	•
	Methylene chloride	ND	2.	-
	1,1,2,2-Tetrachloroethane	ND	2.	<u> </u>
	Tetrachloroethene	ND	2.	
	Toluene	ND	2.	٠.
	1,1,1-Trichloroethane	ND	2.	Į.
	1,1,2-Trichloroethane	ND	2.	J .
	Trichloroethene	36	2.	3 .
	Trichlorofluoromethane	ND	2.	0 ug/L
Santa	Vinyl chloride	ND	2.	0 ug/L
	Xylenes (total)	ND	2.	
	2-Chloroethyl vinyl ether	ND	2.	0 ug/L
-	Surrogate	Recover	y Acce	ptable Range
	1,2-Dichloroethane-d4	120	%	80 - 125 \$
	Toluene-d8	103	8	80 - 125
-	Bromofluorobenzene	107	8	80 - 125

^{\$ =} Secondary ion used for quantitation.

ND = Not Detected

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW35-042 Client ID: PTI-MW35-042 LAB ID: 135976-0006-SA

Sampled: 22 JAN 99 Received: 22 JAN 99 Prepared: 26 JAN 99 Analyzed: 26 JAN 99 **AQUEOUS** Matrix: AQUEOUS Sampled: 22 JAN 99 Prepared: 26
Instrument: GC/MS-MC Dilution: 10

Instrument: GC/MS-MC	Dilution: 10		
Parameter	Result Qu	alifier RL	Units
Benzene	5.2	5.0	ug/L
Bromodichloromethane	ND	10	ug/L
Bromoform	ND	10	ug/L
Bromomethane	ND	10	ug/L
Carbon tetrachloride	ND	10	ug/L
Chlorobenzene	ND	10	ug/L
Chloroethane	ND	10	ug/L
Chloroform	42	10	ug/L
Chloromethane	ND	10	ug/L
Dibromochloromethane	ND	10	ug/L
1,2-Dichlorobenzene	ND	10	ug/L
1,3-Dichlorobenzene	ND	10	ug/L
1,4-Dichlorobenzene	ND	10	ug/L
1,1-Dichloroethane	170	10	ug/L
1,2-Dichloroethane	40	10	ug/L
1,1-Dichloroethene	71	10	ug/L
trans-1,2-Dichloroethene	ND	10	ug/L
1,2-Dichloropropane	ND	10	ug/L
cis-1,3-Dichloropropene	ND	10	ug/L
trans-1,3-Dichloropropene	ND	10	ug/L
Ethylbenzene	530	10	ug/L
Methylene chloride	200	10	ug/L
1,1,2,2-Tetrachloroethane	ND	10	ug/L
Tetrachloroethene	ND	10	ug/L
Toluene	ND	10	ug/L
1,1,1-Trichloroethane	ND	10	ug/L
1,1,2-Trichloroethane	ND	10	ug/L
Trichloroethene	290	10	ug/L
Trichlorofluoromethane	ND	10	ug/L
Vinyl chloride	ND	10	ug/L
Xylenes (total)	34	10	ug/L
2-Chloroethyl vinyl ether	ND	10	ug/L
Surrogate	Recovery	Acceptabl	e Range
1,2-Dichloroethane-d4	119	¥ 80 -	125
Toluene-d8	107	% 80 -	125
Bromofluorobenzene	113	¥ 80 -	125

^{\$ =} Secondary ion used for quantitation.

ND = Not Detected

Client Name: Phibro-Tech, Inc. Client ID: PTI-MW37-042 LAB ID: 135976-0007-SA

AQUEOUS 22 JAN 99 Sampled: 22 JAN 99 Prepared: 26 JAN 99 Matrix: Received: 22 JAN 99 Analyzed: 26 JAN 99 Authorized: 22 JAN 99
Instrument: GC/MS-MC

Dilution: 2.0

	·	_ :				
	Parameter	Result	Qualifier	RL	Units	
	Benzene	ND		1.0	ug/L	
	Bromodichloromethane	ND		2.0	ug/L	
	Bromoform	ND		2.0	ug/L	
	Bromomethane	ND		2.0	ug/L	
-	Carbon tetrachloride	ND		2.0	ug/L	
	Chlorobenzene	ND		2.0	ug/L	
	Chloroethane	ND		2.0	ug/L	
سقنت	Chloroform	ND		2.0	ug/L	
_	Chloromethane	ND		2.0	ug/L	
	Dibromochloromethane	ND		2.0	ug/L	
	1,2-Dichlorobenzene	ND		2.0	ug/L	
	1,3-Dichlorobenzene	ND		2.0	ug/L	
	1,4-Dichlorobenzene	ND		2.0	ug/L	
	1,1-Dichloroethane	180		2.0	ug/L	
	1,2-Dichloroethane	42		2.0	ug/L	
	1,1-Dichloroethene	17		2.0	ug/L	
	trans-1,2-Dichloroethene	4.7		2.0	ug/L	
	1,2-Dichloropropane	ND		2.0	ug/L	
2000	cis-1,3-Dichloropropene	ND		2.0	ug/L	
_	trans-1,3-Dichloropropene	ND		2.0	ug/L	
	Ethylbenzene	12		2.0	ug/L	
	Methylene chloride	ND		2.0	ug/L	
	1,1,2,2-Tetrachloroethane	ND		2.0	ug/L	
	Tetrachloroethene	ND		2.0	ug/L	
	Toluene	ND		2.0	ug/L	
	1,1,1-Trichloroethane	ND		2.0	ug/L	
	1,1,2-Trichloroethane	ND		2.0	ug/L	
	Trichloroethene	38		2.0	ug/L	
	Trichlorofluoromethane	ND		2.0	ug/L	
معضع	Vinyl chloride	ND		2.0	ug/L	
_	Xylenes (total)	2.0		2.0	ug/L	
	2-Chloroethyl vinyl ether	ND		2.0	ug/L	
	Surrogate	Recover	У	Acceptable	e Range	
	1,2-Dichloroethane-d4	123	&	80 -	125	\$
	Toluene-d8	107	e S	80 -		•
	Bromofluorobenzene	109	8	80 -	125	

^{\$ =} Secondary ion used for quantitation.

ND = Not Detected

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW09-042 135976-0008-SA

LAB ID: 135976-0008Matrix: AQUEOUS
Authorized: 22 JAN 99 Received: 22 JAN 99 Sampled: 22 JAN 99 Prepared: 27 JAN 99 Dilution: 12 Sampled: 22 JAN 99 Received: 22 JAN 99

Dilution: 12 Instrument: GC/MS-MC

Tibel americ.	211401011. 12			
Parameter	Result	Qualifier	RL	Units
Benzene	ND		6.2	ug/L
Bromodichloromethane	ND		12	ug/L
Bromoform	ND		12	ug/L
Bromomethane	ND		12	ug/L
Carbon tetrachloride	ND		12	ug/L
Chlorobenzene	ND		12	ug/L
Chloroethane	ND		12	ug/L
Chloroform	400		12	ug/L
Chloromethane	ND		12	ug/L
Dibromochloromethane	ND		12	ug/L
1,2-Dichlorobenzene	ND		12	ug/L
1,3-Dichlorobenzene	ND		12	ug/L
1,4-Dichlorobenzene	ND		12	ug/L
1,1-Dichloroethane	490		12	ug/L
1,2-Dichloroethane	230		12	ug/L
1,1-Dichloroethene	100		12	ug/L
trans-1,2-Dichloroethene	ND		12	ug/L
1,2-Dichloropropane	ND		12	ug/L
cis-1,3-Dichloropropene	ND		12	ug/L
trans-1,3-Dichloropropene	ND		12	ug/L
Ethylbenzene	100		12	ug/L
Methylene chloride	940		12	ug/L
1,1,2,2-Tetrachloroethane	ND		12	ug/L
Tetrachloroethene	ND		12	ug/L
Toluene	ND		12	ug/L
1,1,1-Trichloroethane	ND		12	ug/L
1,1,2-Trichloroethane	ND		12	ug/L
Trichloroethene	550		12	ug/L
Trichlorofluoromethane	ND		12	ug/L
Vinyl chloride	ND		12	ug/L
Xylenes (total)	83		12	ug/L
2-Chloroethyl vinyl ether	ND		12	ug/L
Surrogate	Recover	У	Acceptabl	e Range
1,2-Dichloroethane-d4	115	*	80 -	
Toluene-d8	97	ક	80 -	
Bromofluorobenzene	100	*	80 -	125

^{\$ =} Secondary ion used for quantitation.

ND = Not Detected

Client Name: Phibro-Tech, Inc. Client ID: PTI-EB02-042 LAB ID: Matrix: 135976-0009-EB

AQUEOUS 22 JAN 99 Sampled: 22 JAN 99 Received: 22 JAN 99 Authorized: Prepared: 26 JAN 99 Analyzed: 26 JAN 99

Instrument: GC/MS-MH Dilution: 1.0

	Instrument:	GC/MS-MH	Dilution	n: 1.0				
	Parameter		Re	esult	Qualif	fier	RL	Units
-	Benzene		1	1D			0.50	ug/L
	Bromodichlorome	thane	1	1D			1.0	ug/L
	Bromoform		1	1D			1.0	ug/L
	Bromomethane		1	1D			1.0	ug/L
	Carbon tetrachl	.oride	1	1D			1.0	ug/L
	Chlorobenzene		1	1D			1.0	ug/L
	Chloroethane		1	1D			1.0	ug/L
	Chloroform		1	1D			1.0	ug/L
-	Chloromethane		ì	1D			1.0	ug/L
	Dibromochlorome	thane	1	1D			1.0	ug/L
	1,2-Dichloroben	izene	1	1D			1.0	ug/L
-	1,3-Dichloroben	zene	1	1D			1.0	ug/L
	1,4-Dichloroben	izene	1	1D			1.0	ug/L
	1,1-Dichloroeth	ane	1	1D			1.0	ug/L
	1,2-Dichloroeth	ane	1	1D			1.0	ug/L
	1,1-Dichloroeth	ene	1	1D			1.0	ug/L
	trans-1,2-Dichl	oroethene	1	1D			1.0	ug/L
	1,2-Dichloropro	pane	1	1D			1.0	ug/L
attains.	cis-1,3-Dichlor	opropene	1	1D			1.0	ug/L
•	trans-1,3-Dichl	oropropene	1	1D			1.0	ug/L
	Ethylbenzene		ì	1D			1.0	ug/L
	Methylene chlor	ide	1	1D			1.0	ug/L
تنفقة	1,1,2,2-Tetrach	loroethane	1	1D			1.0	ug/L
	Tetrachloroethe	ne	1	1D			1.0	ug/L
	Toluene		1	1D			1.0	ug/L
	1,1,1-Trichloro	ethane	1	1D			1.0	ug/L
-	1,1,2-Trichloro	ethane	1	1D			1.0	ug/L
	Trichloroethene	!	1	1D			1.0	ug/L
	Trichlorofluoro	methane		1D			1.0	ug/L
	Vinyl chloride		1	1D			1.0	ug/L
*****	Xylenes (total)		1	1D			1.0	ug/L
	2-Chloroethyl v	rinyl ether	1	1D			1.0	ug/L
-	Surrogate		Re	cover	У		Acceptabl	e Range
	1,2-Dichloroeth	ane-d4	3	L00		ક	80 -	125
	Toluene-d8			97		ફ	80 -	125
-	Bromofluorobenz	ene		94		%	80 -	125

Client Name: Phibro-Tech, Inc. Client ID: PTI-TB03-042 LAB ID: 135976-0010-TB

Matrix: AQUEOUS Sampled: 22 JAN 99 Received: 22 JAN 99 Analyzed: 26 JAN 99 Authorized: 22 JAN 99
Instrument: GC/MS-MH Prepared: 26 JAN 99

Dilution: 1.0

Instrument: GC	/MS-MH	Dilution: 1.0			
Parameter		Result	Qualifier	RL	Units
Benzene		ND		0.50	ug/L
Bromodichloromethan	e	ND		1.0	ug/L
Bromoform		ND		1.0	ug/L
Bromomethane		ND		1.0	ug/L
Carbon tetrachloride	e	ND		1.0	ug/L
Chlorobenzene		ND		1.0	ug/L
Chloroethane		ND		1.0	ug/L
Chloroform		ND		1.0	ug/L
Chloromethane		ND		1.0	ug/L
Dibromochloromethane	e	ND		1.0	ug/L
1,2-Dichlorobenzene		ND		1.0	ug/L
1,3-Dichlorobenzene		ND		1.0	ug/L
1,4-Dichlorobenzene		ND		1.0	ug/L
1,1-Dichloroethane		ND		1.0	ug/L
1,2-Dichloroethane		ND		1.0	ug/L
1,1-Dichloroethene		ND		1.0	ug/L
trans-1,2-Dichloroet	thene	ND		1.0	ug/L
1,2-Dichloropropane		ND		1.0	ug/L
cis-1,3-Dichloroprop	pene	ND		1.0	ug/L
trans-1,3-Dichlorop	ropene	ND		1.0	ug/L
Ethylbenzene		ND		1.0	ug/L
Methylene chloride		ND		1.0	ug/L
1,1,2,2-Tetrachloroe	ethane	ND		1.0	ug/L
Tetrachloroethene		ND		1.0	ug/L
Toluene		ND		1.0	ug/L
1,1,1-Trichloroethar		ND		1.0	ug/L
1,1,2-Trichloroethar	ne	ND		1.0	ug/L
Trichloroethene		ND		1.0	ug/L
Trichlorofluorometha	ane	ND		1.0	ug/L
Vinyl chloride		ND		1.0	ug/L
Xylenes (total)	_	ND		1.0	ug/L
2-Chloroethyl vinyl	ether	ND		1.0	ug/L
Surrogate		Recovery	7	Acceptabl	e Range
1,2-Dichloroethane-	1 4	113	8	80 -	125
Toluene-d8		109	*	80 -	125
Bromofluorobenzene		106	8	80 -	125

QC LOT ASSIGNMENT REPORT - MS QC Volatile Organics by GC/MS

	Laboratory			QC Lot Number	QC Run Number	MS QC Run Number
***	Sample Number	QC Matrix	QC Category	(DCS)	(SCS/BLANK/LCS)	(SA,MS,SD,DU)
	135976-0001-SA	AQUEOUS	Q8260-A		26 JAN 99-AHX	26 JAN 99-AH
	135976-0002-SA	AQUEOUS	Q8260-A		26 JAN 99-AHX	26 JAN 99-AH
-	135976-0003-SA	AQUEOUS	Q8260-A		26 JAN 99-AHX	26 JAN 99-AH
	135976-0004-SA	AQUEOUS	Q8260-A		26 JAN 99-AHX	26 JAN 99-AH
	135976-0005-SA	AQUEOUS	Q8260-A		26 JAN 99-BCX	26 JAN 99-AH
	135976-0006-SA	AQUEOUS	Q8260-A		26 JAN 99-BCX	26 JAN 99-AH
-	135976-0007-SA	AQUEOUS	Q8260-A		26 JAN 99-BCX	26 JAN 99-AH
	135976-0008-SA	AQUEOUS	Q8260-A		26 JAN 99-BCX	26 JAN 99-AH
	135976-0009-EB	AQUEOUS	08260-A		26 JAN 99-AHX	26 JAN 99-AH
	135976-0010-TB	AQUEOUS	Q8260-A		26 JAN 99-AHX	26 JAN 99-AH

METHOD BLANK REPORT

Volatile Organics by GC/MS

Project: 135976

Test: Q8260-DW-AP Method SW8260B - Volatile Organics - 25 mL

Matrix: AOUEOUS Date Analyzed: 26 JAN 99 QC Run: 26 JAN 99-AHX Reporting Result Units Limit Analyte 0.50 ND ug/L Benzene 1.0 Bromodichloromethane ND ug/L 1.0 Bromoform ND ug/L Bromomethane ND ug/L 1.0 ND ug/L 1.0 Carbon tetrachloride 1.0 Chlorobenzene ND ug/L ND ug/L 1.0 Chloroethane 1.0 ND ug/L Chloroform 1.0 ND ug/L Chloromethane ug/L 1.0 Dibromochloromethane ND 1,2-Dichlorobenzene ND ug/L 1.0 1,3-Dichlorobenzene ND uq/L 1.0 ug/L 1.0 1,4-Dichlorobenzene ND 1.0 ND ug/L 1,1-Dichloroethane ug/L 1.0 ND 1,2-Dichloroethane 1.0 ND ug/L 1,1-Dichloroethene 1.0 ug/L trans-1,2-Dichloroethene ND ug/L 1.0 1,2-Dichloropropane ND ND ug/L 1.0 cis-1,3-Dichloropropene ND ug/L 1.0 trans-1,3-Dichloropropene ND ug/L 1.0 Ethylbenzene 1.0 Methylene chloride ND ug/L ND ug/L 1.0 1,1,2,2-Tetrachloroethane ND 1.0 ug/L Tetrachloroethene 1.0 ND ug/L Toluene 1.0 ND 1,1,1-Trichloroethane ug/L 1,1,2-Trichloroethane 1.0 ND ug/L ND ug/L 1.0 Trichloroethene ug/L 1.0 Trichlorofluoromethane ND ND ug/L 1.0 Vinyl chloride ug/L ND 1.0 Xylenes (total) 2-Chloroethyl vinyl ether ND ug/L 1.0 Surrogate Recovery Acceptable Range

ND = Not Detected

1,2-Dichloroethane-d4

Bromofluorobenzene

Toluene-d8

102

102

96

80 -125

80 -125 80 -125 METHOD BLANK REPORT (cont.) Volatile Organics by GC/MS

Project: 135976

Test: Q8260-DW-AP Method SW8260B - Volatile Organics - 25 mL (cont.)

Matrix: AQUEOUS

Date Analyzed: 26 JAN 99 QC Run: 26 JAN 99-BCX Reporting Limit Result Units Analyte ug/I 0.50 ND Benzene 1.0 ug/I Bromodichloromethane ND ug/I Bromoform ND 1.0 Bromomethane ND 1.0 ug/I Carbon tetrachloride ND ug/I 1.0 Chlorobenzene ND ug/≒ 1.0 1.0 Chloroethane ND ug/고 1.0 Chloroform ND ug/ኌ 1.0 Chloromethane NDug/L ug/I Dibromochloromethane ND 1.0 ug/I 1.0 1,2-Dichlorobenzene ND ND ug/エ 1.0 1,3-Dichlorobenzene 1.0 ND ug/I 1,4-Dichlorobenzene 1.0 NDug/I 1,1-Dichloroethane 1.0 ND 1,2-Dichloroethane ug/⊥ 1.0 1,1-Dichloroethene ND ug/I trans-1,2-Dichloroethene ND ug/I 1.0 1,2-Dichloropropane ND ug/,⊥ 1.0 ND 1.0 cis-1,3-Dichloropropene ug/L trans-1,3-Dichloropropene ND ug/江 1.0 Ethylbenzene ND ug/IL 1.0 ND 1.0 Methylene chloride ug/⊥ 1,1,2,2-Tetrachloroethane ND1.0 ug/'L 1.0 Tetrachloroethene NDug/工 ND1.0 Toluene ug/I 1,1,1-Trichloroethane NDug/工 1.0 1,1,2-Trichloroethane ND ug/I Trichloroethene NDug/🍱 1.0 ug/⊥ Trichlorofluoromethane 1.0 NDND 1.0 Vinyl chloride ug/ ≟ Xylenes (total) NDug/I 1.0 ND 1.0 2-Chloroethyl vinyl ether ug/I

Surrogate	Recovery	Acceptable Range
1,2-Dichloroethane-d4 Toluene-d8	111 98	80 -125 80 -125
Bromofluorobenzene	101	80 -125

LABORATORY CONTROL SAMPLE REPORT

Volatile Organics by GC/MS

Project: 135976

Category: Q826	0-A Method	SW8260B -	Volatile	Organics
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Matrix: AQUEOUS QC Run: 26 JAN 99-BCX Date Analyzed: 26 JAN 99

Concentration Units: ug/L

		Concentration			Accuracy(%)		
	Analyte	Spiked	Measured	LCS	Limits		
	1,1-Dichloroethene	10.0	10.0	100	70-135		
	Trichloroethene	10.0	10.4	104	70-130		
	Benzene	10.0	10.4	104	80-120		
	Toluene	10.0	10.2	102	80-120		
-	Chlorobenzene	10.0	10.9	109	80-120		
		Conce	ntration	Accui	acy(%)		
<i>a</i> .	Surrogates	Spiked	Measured	LCS	Limits		
	1,2-Dichloroethane-d4	10.0	11.1	111	80-125		
	Bromofluorobenzene	10.0	10.8	108	80-125		
-	Toluene-d8	10.0	10.3	103	80-125		

Category: Q8260-A Method SW8260B - Volatile Organics

Matrix: AQUEOUS Date Analyzed: 26 JAN 99

QC Run: 26 JAN 99-AHX Concentration Units: ug/L

	concentration units: ug/L				
		Concer	Accu	cacy(%)	
-	Analyte	Spiked	Measured	LCS	Limits
	1,1-Dichloroethene	10.0	10.0	100	70-135
	Trichloroethene	10.0	10.4	104	70-130
-	Benzene	10.0	10.2	102	80-120
_	Toluene	10.0	10.4	104	80-120
	Chlorobenzene	10.0	10.6	106	80-120
-		Concentration		Accuracy(%)	
	Surrogates	Spiked	Measured	LCS	Limits
	1,2-Dichloroethane-d4	10.0	8.88	89	80-125
	Bromofluorobenzene	10.0	10.7	107	80-125
	Toluene-d8	10.0	10.7	107	80-125

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE QC REPORT

Volatile Organics by GC/MS

Project: 135976

■ Category: Q8260-A Method SW8260B - Volatile Organics

Matrix: AQUEOUS Sample: 135937-0002 MS Run: 26 JAN 99-AH

Units: ug/L

		Conc	centration	7		7.00000000
Analyte	Sample Result	MS Result	MSD Result	Amount Spiked MS/MSD	%Recovery %	Acceptance RPD Limit Recov. RPD
■ 1,1-Dichloroethene	ND	8.93	9.59	10.0	89 96	7.1 70-135 25
Trichloroethene	ND	10.5	10.1	10.0	105 101	3.7 70-130 25
Benzene	ND	9.76	9.24	10.0	98 92	5.5 80-120 25
Toluene	ND	9.99	9.66	10.0	100 97	3.4 80-120 25
Chlorobenzene	ND	10.5	9.95	10.0	105 100	5.0 80-120 25
	Sample			%Rec	overy	Acceptance Limit
Surrogates	%Recovery			MS	MSD	Recovery
1,2-Dichloroethane-d4	100			95	111	80-125
Bromofluorobenzene	101			107	104	80-125
Toluene-d8	104			101	102	80-125

MTD = Not Detected

malculations are performed before rounding to avoid round-off errors in calculated results.

Metals

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW04-042 Client ID:

LAB ID:

PTI-MW04-042 135976-0001-SA

Matrix: AQUEOUS
Authorized: 22 JAN 99

Sampled: 22 JAN 99

Received: 22 JAN 99 Analyzed: See Below

Prepared: See Below

Parameter	

arameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
admium	0.58	2.0	0.010	mq/L	6010B	26 JAN 99	27 JAN 99

***	Cadmium Chromium	0.58 85.2	C	2.0	0.010	mg/L	6010B	26	JAN JAN	99	27	JAN	99
	Copper	ND	G	2.0	0.040	mg/L	6010B	26	JAN	99	27	JAN	99

G = Reporting limit(s) raised due to matrix interference.

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW14S-042
LAB ID: 135976-0002-SA
Matrix: AQUEOUS
Authorized: 22 JAN 99

Sampled: 22 JAN 99 Prepared: See Below

Received: 22 JAN 99 Analyzed: See Below

-	Parameter	Result Qual	DIL	RL	Units	Method	Date	Date
-	Cadmium Chromium Copper	ND 0.032 ND	1.0 1.0 1.0		mg/L mg/L	6010B 6010B 6010B	26 JAN 99 26 JAN 99 26 JAN 99	27 JAN 99

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW15S-042
LAB ID: 135976-0003-SA
Matrix: AQUEOUS
Authorized: 22 JAN 99

Sampled: 22 JAN 99
Prepared: See Below Received: 22 JAN 99
Analyzed: See Below

***	Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
	Cadmium Chromium Copper	ND ND ND	1.0 1.0 1.0	0.0050 0.010 0.020	mg/L mg/L mg/L	6010B 6010B 6010B	26 JAN 99 26 JAN 99 26 JAN 99	27 JAN 99

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW15D-042
LAB ID: 135976-0004-SA
Matrix: AQUEOUS
Authorized: 22 JAN 99

Sampled: 22 JAN 99 Received: 22 JAN 99 Prepared: See Below Analyzed: See Below

-	Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
	Cadmium	ND	1.0	0.0050	- '.	6010B	26 JAN 99	
	Chromium	0.053	1.0	0.010	mg/L	6010B	26 JAN 99	
	Copper	0.029	1.0	0.020	mg/L	6010B	26 JAN 99	27 JAN 99

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW16-042
LAB ID: 135976-0005-SA
Matrix: AQUEOUS
Authorized: 22 JAN 99

Sampled: 22 JAN 99
Prepared: See Below Received: 22 JAN 99
Analyzed: See Below

	Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
	Cadmium	ND	1.0	0.0050	- · .	6010B	26 JAN 99	
-	Chromium	ND	1.0	0.010	mg/L	6010B	26 JAN 99	27 JAN 99
	Copper	ND	1.0	0.020	mg/L	6010B	26 JAN 99	27 JAN 99

Client Name: Phibro-Tech, Inc.

Client ID:

PTI-MW35-042

LAB ID: Matrix:

135976-0006-SA

AQUEOUS

Sampled: 22 JAN 99

Received: 22 JAN 99

Authorized:

Analyzed: See Below

22 JAN 99

Prepared: See Below

-	Parameter	Result	Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
si-man	Cadmium Chromium	0.61 87.3		2.0	0.010	mg/L mg/L	6010B 6010B	26 JAN 99 26 JAN 99	
	Copper	ND	G	2.0	0.040	mg/L	6010B	26 JAN 99	

G = Reporting limit(s) raised due to matrix interference.

Client Name: Phibro-Tech, Inc. Client ID: PTI-MW37-042

LAB ID: Matrix:

135976-0007-SA AQUEOUS

Authorized:

Sampled: 22 JAN 99 22 JAN 99 Prepared: See Below

Received: 22 JAN 99 Analyzed: See Below

-	Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
	Cadmium	ND	1.0	0.0050	mg/L	6010B	26 JAN 99	27 JAN 99
•	Chromium	ND	1.0	0.010	mg/L	6010B	26 JAN 99	27 JAN 99
	Copper	ND	1.0	0.020	mg/L	6010B	26 JAN 99	27 JAN 99

METALS (Water)

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW09-042
LAB ID: 135976-0008-SA
Matrix: AQUEOUS
Authorized: 22 JAN 99

Sampled: 22 JAN 99 Received: 22 JAN 99 Sampled: 22 JAN 99 Prepared: See Below

Analyzed: See Below

iai	Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
-	Cadmium Chromium Copper	ND ND	1.0 1.0 1.0	0.0050 0.010 0.020	mg/L mg/L mg/L	6010B 6010B 6010B	26 JAN 99 26 JAN 99 26 JAN 99	27 JAN 99

ND = Not Detected

METALS (Water)

Client Name: Phibro-Tech, Inc.
Client ID: PTI-EB02-042
LAB ID: 135976-0009-EB
Matrix: AQUEOUS
Authorized: 22 JAN 99

Sampled: 22 JAN 99 Received: 22 JAN 99 Prepared: See Below Analyzed: See Below

•	Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
•	Cadmium Chromium Copper	0.0066 2.5 ND	1.0 1.0 1.0	0.0050 0.010 0.020	mg/L mg/L mg/L	6010B 6010B 6010B	26 JAN 99 26 JAN 99 26 JAN 99	27 JAN 99

ND = Not Detected

QC LOT ASSIGNMENT REPORT - MS QC Metals Analysis and Preparation

	125076 0001 07				
iii	135976-0001-SA 135976-0002-SA 135976-0003-SA 135976-0004-SA 135976-0006-SA 135976-0006-SA 135976-0007-SA 135976-0008-SA	AQUEOUS AQUEOUS AQUEOUS AQUEOUS AQUEOUS AQUEOUS AQUEOUS AQUEOUS	QICP-A QICP-A QICP-A QICP-A QICP-A QICP-A QICP-A	26 JAN 99-AX 26 JAN 99-AX	26 JAN 99-AA
	135976-0009-EB	AQUEOUS	QICP-A	26 JAN 99-AX	26 JAN 99-AA

METHOD BLANK REPORT

Metals Analysis and Preparation

Project: 135976

Test: Q-ICP-AR Matrix: AQUEOUS

Method 6010B - ICP Metals

QC Run: 26 JAN 99-AX Date Analyzed: 26 JAN 99

Reporting

Analyte	Result	Units	Limit
Cadmium Chromium Copper	ND ND ND	mg/L mg/L mg/L	0.0050 0.010 0.020

LABORATORY CONTROL SAMPLE REPORT Metals Analysis and Preparation

Project: 135976

Category: QICP-A Method 6010B - ICP Metals

Matrix: AQUEOUS Date Analyzed: 26 JAN 99

Matrix: AQUEOUS
QC Run: 26 JAN 99-AX
Concentration Units: mg/L

_		Conce	ntration	Accuracy(%)		
	Analyte	Spiked	Measured	LCS	Limits	
	Cadmium	0.0500	0.0544	109	80-120	
	Chromium	0.200	0.209	105	80-115	
	Copper	0.250	0.260	104	85-115	

Calculations are performed before rounding to avoid round-off errors in calculated results.

■ MATRIX SPIKE/MATRIX SPIKE DUPLICATE QC REPORT

Metals Analysis and Preparation

Project: 135976

Category: QICP-A Method 6010B - ICP Metals

Matrix: AQUEOUS
Sample: 135968-0001
MS Run: 26 JAN 99-AA
Units: mg/L

Concentration								
•	Analyte	Sample Result	MS Result	MSD Result	Amount Spiked MS/MSD	%Recovery %RPD MS MSD	Acceptance Limit Recov. RPD	
***	Cadmium Chromium Copper	ND ND 0.0140 J	0.0515 0.206 0.274	0.0526 0.198 0.275	0.0500 0.200 0.250	103 105 2.1 103 99 4.1 104 104 0.2	80-120 20 80-115 20 85-115 20	

J = Result is detected below the reporting limit or is an estimated concentration.

^{) =} Not Detected

Calculations are performed before rounding to avoid round-off errors in calculated results.

General Chemistry

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW04-042
LAB ID: 135976-0001-SA
Matrix: AQUEOUS
Authorized: 22 JAN 99

Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
Chromium, Hexavalent pH	78.6 6.4	2000 1.0	40.0 NA	mg/L units	SW7196 SW9040	NA NA	23 JAN 99 22 JAN 99

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW14S-042
LAB ID: 135976-0002-SA
Matrix: AQUEOUS
Authorized: 22 JAN 99

شن	Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
***	Chromium, Hexavalent pH	0.058 7.1	1.0	0.020 NA	mg/L units	SW7196 SW9040	NA NA	23 JAN 99 22 JAN 99

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW15S-042
LAB ID: 135976-0003-SA
Matrix: AQUEOUS
Authorized: 22 JAN 99

-	Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
	Chromium, Hexavalent pH	0.024 7.4	1.0	0.020 NA	mg/L units	SW7196 SW9040	NA NA	23 JAN 99 22 JAN 99

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW15D-042
LAB ID: 135976-0004-SA
Matrix: AQUEOUS
Authorized: 22 JAN 99

Sampled: 22 JAN 99 Received: 22 JAN 99 Prepared: See Below Analyzed: See Below

Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
Chromium, Hexavalent pH	ND 7.3	1.0	0.020 NA	mg/L units	SW7196 SW9040	NA NA	23 JAN 99 22 JAN 99

ND = Not Detected

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW16-042
LAB ID: 135976-0005-SA
Matrix: AQUEOUS Sampled: 22 JAN 99 Sampled: 22 JAN 99 Prepared: See Below

Received: 22 JAN 99

Authorized: 22 JAN 99

Analyzed: See Below

Prep Analyzed Result Qual DIL RL Units Method Date Date Parameter Chromium, ND 1.0 0.020 mg/L SW7196 NA 23 JAN 99 1.0 NA units SW9040 NA 22 JAN 99 Hexavalent 6.8 рН

ND = Not Detected

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW35-042
LAB ID: 135976-0006-SA
Matrix: AQUEOUS
Authorized: 22 JAN 99

_	Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
in .	Chromium, Hexavalent pH	124 6.4	2000	40.0 NA	mg/L units	SW7196 SW9040	NA NA	23 JAN 99 22 JAN 99

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW37-042
LAB ID: 135976-0007-SA
Matrix: AQUEOUS
Authorized: 22 JAN 99

Sampled: 22 JAN 99

Received: 22 JAN 99

Authorized:

22 JAN 99

Prepared: See Below

Analyzed: See Below

	Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
	Chromium,							
	Hexavalent	ND	1.0	0.020	mg/L	SW7196	NA	23 JAN 99
ė	Hq	7.0	1.0	NA	units	SW9040	NA	22 JAN 99

ND = Not Detected

Client Name: Phibro-Tech, Inc.
Client ID: PTI-MW09-042
LAB ID: 135976-0008-SA
Matrix: AQUEOUS
Authorized: 22 JAN 99

	Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
i	Chromium, Hexavalent pH	3.3 6.3	100 1.0	2.0 NA	mg/L units	SW7196 SW9040	NA NA	23 JAN 99 22 JAN 99

Client Name: Phibro-Tech, Inc.
Client ID: PTI-EB02-042
LAB ID: 135976-0009-EB
Matrix: AQUEOUS
Authorized: 22 JAN 99

Sampled: 22 JAN 99 Received: 22 JAN 99 Prepared: See Below Analyzed: See Below

	Parameter	Result Qual	DIL	RL	Units	Method	Prep Date	Analyzed Date
	Chromium, Hexavalent	ND	1.0	0.020	mg/L	SW7196	NA	23 JAN 99
-	рH	6.8	1.0	NA	units	SW9040	NA	22 JAN 99

ND = Not Detected

QC LOT ASSIGNMENT REPORT - MS QC Wet Chemistry Analysis and Preparation

-	Laboratory Sample Number	QC Matrix	QC Category	QC Lot Number (DCS)	QC Run Number (SCS/BLANK/LCS)	MS QC Run Number (SA, MS, SD, DU)
	135976-0001-SA	AQUEOUS	QCR6-A		23 JAN 99-AX	23 JAN 99-AA
	135976-0002-SA	AQUEOUS	QCR6-A		23 JAN 99-AX	23 JAN 99-AA
-	135976-0003-SA	AQUEOUS	QCR6-A		23 JAN 99-AX	23 JAN 99-AA
	135976-0004-SA	AQUEOUS	QCR6-A		23 JAN 99-AX	23 JAN 99-AA
	135976-0005-SA	AQUEOUS	QCR6-A		23 JAN 99-AX	23 JAN 99-AA
	135976-0006-SA	AQUEOUS	QCR6-A		23 JAN 99-AX	23 JAN 99-AA
-	135976-0007-SA	AQUEOUS	QCR6-A		23 JAN 99-AX	23 JAN 99-AA
	135976-0008-SA	AQUEOUS	QCR6-A		23 JAN 99-AX	23 JAN 99-AA
	135976-0009-EB	AQUEOUS	QCR6-A		23 JAN 99-AX	23 JAN 99-AA

LABORATORY CONTROL SAMPLE REPORT

GC/MS Preparation Project: 135976

Category: PH-A pH for Aqueous Samples

Matrix: AQUEOUS Date Analyzed: 22 JAN 99

QC Run: 22 JAN 99-AX

Concentration Units: units

	Concer	ntration	Accur	cacy(%)
Analyte	Spiked	Measured	LCS	Limits
пH	9.18	9.14	100	98-102

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE QC REPORT

Wet Chemistry Analysis and Preparation

Project: 135976

Method 7196 - Chromium, Hexavalent Category: QCR6-A

Matrix: AQUEOUS
Sample: 135976-0007
MS Run: 23 JAN 99-AA
Units: mg/L

Concentration

-		Sample	MS	MSD	Amount Spiked	%Recover	y %RPD	Acceptar Limit		
	Analyte	Result	Result	Result	MS/MSD	MS MSD	•	Recov.	RPD	
	Chromium, Hexavalent	ND	0.0535	0.0488	0.0500	107	98 9.2	85-115	20	

ND = Not Detected

malculations are performed before rounding to avoid round-off errors in calculated results.

QC LOT ASSIGNMENT REPORT - MS QC GC/MS Preparation

	Laboratory			QC Lot Number	QC Run Number MS QC 1	Run Number
***	Sample Number	QC Matrix	QC Category	(DCS)	(SCS/BLANK/LCS) (SA, MS	,SD,DU)
	135976-0001-SA	AQUEOUS	PH-A		22 JAN 99-AX 22 JAN	99-AA
	135976-0002-SA	AQUEOUS	PH-A		22 JAN 99-AX 22 JAN	99-AA
-	135976-0003-SA	AQUEOUS	PH-A		22 JAN 99-AX 22 JAN	99-AA
	135976-0004-SA	AQUEOUS	PH-A		22 JAN 99-AX 22 JAN	99-AA
	135976-0005-SA	AQUEOUS	PH-A		22 JAN 99-AX 22 JAN	99-AA
	135976-0006-SA	AQUEOUS	PH-A		22 JAN 99-AX 22 JAN	99-AA
	135976-0007 - SA	AQUEOUS	PH-A		22 JAN 99-AX 22 JAN	99-AA
	135976-0008-SA	AQUEOUS	PH-A		22 JAN 99-AX 22 JAN	99-AA
	135976-0009-EB	AQUEOUS	PH-A		22 JAN 99-AX 22 JAN	99-AA

LABORATORY CONTROL SAMPLE REPORT

GC/MS Preparation Project: 135976

Category: PH-A pH for Aqueous Samples

Matrix: AQUEOUS QC Run: 22 JAN 99-AX Date Analyzed: 22 JAN 99

Concentration Units: units

Accuracy(%) Concentration Spiked Measured LCS Limits Analyte 9.14 100 98-102 9.18 рН

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX DUPLICATE QC REPORT

GC/MS Preparation Project: 135976

pH for Aqueous Samples

Category: PH-A pH Matrix: AQUEOUS Sample: 135976-0001 MS Run: 22 JAN 99-AA Units: units

-		Co	oncentration		
	Analyte	Sample	Duplicate	%RPD SA-DU	Acceptance Limit
	рН	6.39	6.41	0.31	30

Calculations are performed before rounding to avoid round-off errors in calculated results.

Appendix C Completed COC Forms



QUA-4124 0797																				
Client Cama Dresser Makes	Project Mai	nager	5ha	rs	n l	Wal	llir	<u>_</u>					Date	-19-	-90	7	Cha	ain of Custody N	umber 8	332
Address	Telephone	Num	er (Are	ח.ו בי	aeuray	Numne	? <i>r</i>							Number			+			,
18881 Von Karman #650	949	_ ~	752	2	545	Z	17	152	-13	07	7						Pa	ge	_ of	<u></u>
City (CVINE State Zip Code CA 92612	Site Contact				Di	Contact UNC	2, 5	uzi	ıKı					(Attach li ce is need		- 1	\dashv			
Project Name Phibro-Tech Contract/Purchase Order/Quote No.	Carrier/Wa	ybill N	umber								B	40						Special I	nstruction	ns/
Contract/Purchase Order/Quote No. 2279-11462-FLD-FIEL			Matri	x		Pres		ers & tives		60	\mathcal{S}	T						Condition	s of Rece	eipt
Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Time	Aqueous	Sed.	100	Unpres.	H2SO4 HNOS	HCI	NaOH ZnAc/	NaOH	82	CT)	9								
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	V	Ш			X					<u> </u>		X					8	Field F	ittere	2
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QUA-4124 0797																									
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	Sample I.D. No. and Description (Containers for each sample may be combined or	n one	line) Date	Time	Aqueous	Sed.	Soil		Unpres	HNOS	ΤĊ	NaOH	ZnAc/ NaOH	\widetilde{x}												
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1881 Von Karman Ave #6	50	949	75	52·	5	452	2/9/	19	75	52 /	30	7						Pa	ge	of	_3_
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	Possible Hazard Identification	· · · · · ·	1 -			isposa							_									sessed					
Po	Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ I	Poison B 🔲	Unknown [<u> </u>	eturr	To C	lient		Disp			ab L s (Spec		chive	For		мс	onths	long	er thar	1 3 mo	nths)					
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QUA	-4124 0797																														
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(0	Sample I.D. No. and Descr Containers for each sample may be comb		ne line)	Date	Time	Aqueous	Sed.	Soil		Unpres.	H2SO4	HCI	NaOH	ZnAc/	NaCh	82	S	Š													
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Appendix D Background Groundwater Concentrations

CITY OF ANTAFE SPRINGS

19 ANA CUALIVATE OUALIVATE REPORTATION TO THE PORTATION T

The City of Santa Fe Springs pleased to provide the following Water Quality Report. Upon review should be obvious that water provide by the Santa Fe Springs Water Utility, safe, drinkable, and of good quality.

MONITORING PROGRAM

The City of Santa Fe Springs receiv its water from two sources. Metropolitan Water District (MWD) lotal wells. Water from the MWD imported from throughout the State is regulated by the Califor Department Health of and the Central Basin Municipal Wa District (CBMWD) regulates groundu ter. The City of Santa Fe Springs wo With both agencies to test and month each source. Together, the MU CBMWD and City provide the Water possible.

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SAFETY STANDARDS

There are two types of standards that protect your water supply. Primary standards address contaminants that could affect our health. Secondary andards regulate chemicals that affect the aesetic qualities of water, such as taste, odor and appearance. Regulations establish a Maximum Contaminant Level (MCL) for each. Santa Fe Springs es to it that MCLs are met, and corrected if they exceeded. Not all chemicals are regulated with MCLs, but many more chemicals are being added to the compliance list each year by the Department of salth Services and the U.S. Environmental Motection Agency. California also requires monitoring of unregulated chemicals.

Water treatment procedures have all but elimited water-borne diseases. Media reports of cryptosporidium in water have been over exaggerated and there is little if any chance of it being present.

While the public is not at risk, cryptosporidium prove life-threatening to people with compromised immune systems - such as chemotherapy potients, organ and bone marrow recipients or people infected with HIV or AIDS. As a precaution, people with such conditions should consult their doctor or health care provider to prevent infection from all tential sources. They may also boil their water five minutes before consumption as a further precaution.

'NDERSTANDING THE WATER OUALITY REPORT

The information on the chart shows the results for various water quality analysis conducted during the year. When reading the list, you will note that Santa fe Springs' water supply is of better quality than required by federal and State standards.

This report is an important part of the City of State Fe Springs' ongoing water quality effort as required by the California Department of Health S vices. If you have any questions about this information, please call 868-0511.

	ILUGRAMS PEI			nillion)
	ICROGRAMS A			
N	ICROMHOS PE	R CENTI	METER	

umhos/cm = MICROMHOS PER CENTIMETER

MCL = MAXIMUM CONTAMINANT LEVEL

MFL = MILUON FIBERS PER UTER (Longer than 10 um)

ND = NONE DETECTED / pci/l = picoCuries per uter na = not analyzed

ua/I

IR = NOT REQUIRED FOR COMPURINCE PURPOSES

NC = NOT COLLECTED

III = MONITORING IS U

MONITORING IS WAIVED (Based on vulnerability assessment, historic data and source susceptibility)

NO. OF ACUTE VIOLATIONS

 Monitoring was completed for unregulated organics in addition to the regulated constituents listed. Results for all constituents were below detection levels unless them use noted.

(b) uaride results and MCl's are temperature dependent.

(c) this constituent were collected from points in the distribution system.

(d) The Metropolitan Water District of Southern California, which supplies the surface water, has developed a more accurate method to detect adors. This information available upon request from the Metropolitan Water District.

(e) tian level based on sample results at customer top

(f) econdary MCL indicated in parentheses.

	1	NDWATER		ACE WATER	1
CONSTITUENTS(8)	AVERAGE	RANGE	AVERAGE		MCL (b)
GENERAL MINERAL - mg	ŽĪ 249	37-338	285	249-327	_
CALCIUM	72	15-99	69 28	60-80 24-32	,
Magnesium Sodium	19 75	NO-35 39-136	97	86-112	4,√Iy
/ POTASSIUM Total Alkalinity (25 C2C03)	· 3.1 163	1,4-4.2 104-185	4.5 116	3.9-5.1 103-132	Ξ
SULFATE CHLORIDE	154 55	59-290 16-88	246 91	206-294 80-102	250-600 (f) 250-600 (f)
NITRATE (as NO3)	3.3 NO	ND-12.0 NO	.95 MO	ND-1.63 ND	45
, NITRITE (as N) PLUORIDE	0.47(b)	0.29-1.00	0.23	0.17-0.28	1.4-2.4
COPPER IRON	0.13 0.121	ND-0.467 ND-0.525	NO NO	ND ND	1 (e) 0.3 (f)
MANGANESE ZINC	0.008 ND	ND-0.031 ND	ND ND	160 300	0.05 (f) 5 (f)
FOAMING AGENT (MBAS) TOTAL DISSOLVED SOLIDS	NO 500	ND 250-739	ND 617	ND 541-715	0.5 (f) 500-1500(f)
GENERAL PHYSICAL	STATE OF STATE		Miles in		
pH (std unit)	8.0	7.9-8.5	8.04	8.06-8.08	6.5-8.5 (f)
SPECIFIC CONDUCTANCE (umhos/cm)	771	390-1130	991	B96-1114	900-2200(1)
UNITS OF COLOR THRESHOLD ODOR NO. (TON)	ND (c) 1 (c)	ND-5 1-2	25 (0)	1.0-4.0 (d)	15 (f) 3 (f)
TURBIDITY (nlw)	0.14(c)	0.10-0.90	0.08	0.06-0.10	5 (1)
RADIOLOGICAL - pCi/I GROSS ALPHA	1.6	ND-6.3	6.6	MD-11.7	15
URANIUM GROSS BETA	5.3 MR	4.0-6.0 MR	4.6 7.3	33-5.7 12-11.2	20 50
INORGANICS - ma/l	an .	Paragraph Cons	- 74	12112	
ANTIMONY	NO	NO.	MD.	ND	0.006
ARSENIC ASBESTOS	ND W	MD-0.002	0.002 NO	ND-0.003 ND	0.05 7 MFL
BARIUM BERYLLIUM	0.018 ND	ND-0.110	0.12 ND	0.11-0.13 MD	0.004
CADMUM CHROMIUM	ND ND	MD MD	ND ND	ND ND	0.005
CYANIDE	W	W	ND	ND	0.2
LEAD MERCURY	ND ND	NO-0.008 ND	ND ND	ND NO	0.015 (e) 0.002
MICKEL Selenium	ND ND	MD MD	0.004 ND	0.003-0.008 ND	0.1
SILVER Thallium	ND ND	ND ND	ND NO	NO NO	0.1 0.002
ALUMINUM	KD	MD	0.165	0.083-0.214	1 (0.2) (1)
ORGANICS - ug/l					
2, 4-0 2, 4, 5-TP SILVEX	W W	NO	HA HA	ND NA	70 50
ALACHLOR Atrazine	W ND	W .	ND NO	NO ND	3
SIMAZINE BENTAZON	ND W	MO W	MD MD	MO MO	4 18
BENZO (a) pyrane	W ND	#####################################	ND NA	NO NA	0.2
CARBARYL CARBOFURAN	W	ND W	ND ND	MD	18
CHLORDANE Dalapon	₩ ₩	₩ WD	NO NO	ND ND	0.1 200
DINOSEB DIOUAT Di/2-sthylbexylladinate (DEHA)	W MD	W ND	ND ND	ND ND	7 20
Di(2-ethylhexyl)adipate (DEHA) Di(2-ethylhexyl)phthalate (DEHP)	* *	esia di William William	ND ND	MO MO	400
ETHYLENE DIBROMIDE (EDB)			ND	10	0.05
1, 2, DIBROMO-3- CHLOROPROPANE (DBCP) ENDOTHALL	W	V W	NO ND	HO ND	0.2 100
ENDRIN		W	MD .	NO NO	2,
GLYPHOSATE HEPTACHLOR	MD W	MD W	ND ND	ND ND	700 0.01
HEPTACHLOR EPOXIDE HEXACHLOROBENZENE	*	W	MD MD	NO NO	0.01 50
HEXACHLOROCYCLOPENTADIENE LINDAME	W	W	ND ND	ND ND	50 0.2
METHOXYCHLOR	W	W	ND	ND	40
MOLINATE Oxamyl (vydate)	¥	¥	ND ND	NO NO	20 200
PENTACHLOROPHENOL PICLORAM	w w	W	ND ND	ND ND	1 500
POLYCHLORINATED BIPHENYLS (PI THIOBENCARB		W W	ND ND	ND ND	0.5 70
TOXAPHENE 2,3,7,8-TCDO (Dioxin)	Ÿ	Ÿ	ND ND	ND NO	3 3xE-8
TRIHALOMETHANES,	37.4	WD-96.0	38.5	20.0-84.0	100
TOTAL - TTHMS (c) BENZENE	MD.	100	ND	100	1
CARBON TETRACHLORIDE DICHLOROMETHANE	ND ND	MD MD	ND ND	MD MD	0.5 5
MONOCHLOROBENZENE 1,4-DICHLOROBENZENE	ON ON	ND ND	ND ND	ND ND	30 5
1,1-DICHLOROETHANE - 11DCA 1,2-DICHLOROETHANE - 12DCA	ND ND	100 NO	NO NO	MO MO	5 0.5
1,1-DICHLOROETHENE - 11DCE	ND ND	MO ON	ND NO	NO NO	8
cis-1,2-DICHLOROETHENE trans-1,2-DICHLOROETHENE	10	ND	NO	MO	10
1,2-DICHLOROPROPANE 1,3-DICHLOROPROPENE	NO NO	ND ND	ND ND	ND NO	5 0.5
ETHYLBENZENE FLUOROTRICHLOROMETHANE -	ND	100	ND.	40	700
FREON 11	ND ND	ND NO	NO NO	NO NO	150 100
STYRENE 1,1,2,2-TETRACHLOROETHANE	ND .	. ND	MD	140	1
TETRACHLOROETHENE - PCE 1,2,4-TRICHLOROBENZENE	1.1 #D	ND-4.8 ND	ND ND	ND NO	5 70
TOLUENE 1,1,1-TRICHLOROETHANE -1,1,1TCA	ND ND	MD MD	MD MD	ND ND	150 200
1,1,2-TRICHLOROETHANE -1,1,2TCA	ND .	ND	NA ND	ND ND	5 5
TRICHLOROETHENE - TCE TRICHLOROTRIFLUOROETHANE -	0.3	NO-1.2		who fire your	AGE VIEW
FREON 113 VINYL CHLORIDE	NO NO	ND ND	ND ND	ND ND	1,200 0.5
XYLENES, TOTAL (m, p & o)	NO NO	MD .	10	MO	1750
		and the same of the same			
COLIFORM BACTERIA (c) COLIFORM BACTERIA PA % POSITIV	E 0	0)		5

Appendix E Statistical Analysis

Appendix E-1 Summary of Upper Tolerance Level Calculations SUMMARY OF UPPER TOLERANCE LEVEL CALCULATIONS

Quarterly Background Data: January 1989 to January 1999

Southern California Chemical

POISSON DISTRIBUTED UPPER TOLERANCE LEVEL

COMPOUND	Hexa Chromium	Total Chromium	Cadmium	Соррег	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Trichloroethene
Percent Detected	2.4	9.8	2.4	22.0	2.4	9.8	31.7	34.1	NOT
Sample number(n)	41	41	41	41	41	41	41	41	CALC.
Tn	0.5205	0.3881	0.1159	0.5835	12.1550	24.6050	39.2050	71.4550	
2Tn+2	3.04	2.78	2.23	3.17	26.31	51.21	80.41	144.91	
Chi Squared @95% of di	7.92	7.45	6.45	8.14	39.64	69.34	101.81	168.75	
lamda Tn	0.097	0.091	0.079	0.099	0.483	0.846	1.242	2.058	
Two time Lamda Tn	0.193	0.182	0.157	0.198	0.967	1.691	2.483	4.116	
Beta cov. @95%, deg fr.	2.45	2.40	2.29	2.47	4.62	6.18	7.62	10.15	
k, from 2k+2 deg fr.	0.22	0.20	0.14	0.24	1.31	2.09	2.81	4.08	
		:							

AITCHISON ADJUSTMENT AND CALCULATION OF UPPER TOLERANCE LEVELS

Number of ND(d)	NOT	37	NOT	32	NOT	37	28	27	NO ADJ. REQ.
Number of values(n)	CALC.	41	CALC.	41	CALC.	41	41	41	
Mean of det values		0.0485		0.028		1.800	1.400	4.925	
STD of det values		0.040		0.008		0.361	0.265	0.907	
Atch. Adj. mean/mean(1)		0.005		0.006		0.176	0.444	1.682	12.159
Atch. Adj. std./std. (1)		0.018		0.012		0.550	0.675	2.420	5.441
K for Tolerance Limit		2.292		2.292		2.292	2.292	2.292	1.000
Adjusted Tol. Limit		0.046		0.034		1,435	1.992	7.229	
Unadjusted Tol. Limit									17.599

⁽¹⁾ Unadjusted mean and std. used to compute upper tolerance level for TCE

Appendix E-2 Nonparametric Mann-Whitney U-Test Results MON 3/15/99 1:54:40 PM 0:\2279-111\JAN99\1-11.SYS

THE FOLLOWING RESULTS ARE FOR:
PARAMID\$ = BEN

KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES

DEPENDENT VARIABLE IS VALUE GROUPING VARIABLE IS WELL\$

GROUP COUNT RANK SUM

MW-11 41 1981.000 MW-1S 41 1422.000

MANN-WHITNEY U TEST STATISTIC = 1120.000

PROBABILITY IS 0.003

CHI-SQUARE APPROXIMATION = 8.551 WITH 1 DF

R

THE FOLLOWING RESULTS ARE FOR:

PARAMID\$ = CD

KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES

DEPENDENT VARIABLE IS VALUE

GROUPING VARIABLE IS WELL\$

GROUP COUNT RANK SUM

MW-11 41 1663.500 ■ MW-1S 41 1739.500

4ANN-WHITNEY U TEST STATISTIC = 802.500

ROBABILITY IS 0.626

CHI-SQUARE APPROXIMATION = 0.238 WITH 1 DF

A

THE FOLLOWING RESULTS ARE FOR:

PARAMID\$ = CU

*RRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES

DEPENDENT VARIABLE IS VALUE

GROUPING VARIABLE IS WELL\$

GROUP COUNT RANK SUM

MW-11 41 1728.000 MW-1S 41 1675.000

MANN-WHITNEY U TEST STATISTIC = 867.000

PROBABILITY IS 0.763

CHI-SQUARE APPROXIMATION = 0.091 WITH 1 DF

A

THE FOLLOWING RESULTS ARE FOR:

PARAMID\$ = EBN

KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES

DEPENDENT VARIABLE IS VALUE

GROUPING VARIABLE IS WELL\$

GROUP COUNT RANK SUM

MW-11 41 2469.500 MW-1S 41 933.500

MANN-WHITNEY U TEST STATISTIC = 1608.500

52.215 WITH 1 DF

THE FOLLOWING RESULTS ARE FOR: PARAMIDS = HCR

TUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES DEPENDENT VARIABLE IS VALUE

GROUPING VARIABLE IS WELL\$

COUNT RANK SUM GROUP

MW-11 41 1683.000

MW-1S 41 1720.000

MANN-WHITNEY U TEST STATISTIC = 822.000

ROBABILITY IS 0.787

HI-SQUARE APPROXIMATION = 0.073 WITH 1 DF

HE FOLLOWING RESULTS ARE FOR: PARAMID\$ = TCE

RUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES

DEPENDENT VARIABLE IS VALUE GROUPING VARIABLE IS WELL\$

> COUNT RANK SUM GROUP

MW-11 41 2460.000 MW-1S 41 943.000

MANN-WHITNEY U TEST STATISTIC = 1599.000

PROBABILITY IS 0.000

CHI-SQUARE APPROXIMATION = 49.514 WITH 1 DF

THE FOLLOWING RESULTS ARE FOR:

PARAMID\$ = TCR

KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES

DEPENDENT VARIABLE IS VALUE GROUPING VARIABLE IS WELL\$

GROUP COUNT RANK SUM

1695.500 MW-11 41

■ MW-1S 41 1707.500

ANN-WHITNEY U TEST STATISTIC = 834.500

ROBABILITY IS 0.939

CHI-SQUARE APPROXIMATION = 0.006 WITH 1 DF

THE FOLLOWING RESULTS ARE FOR: PARAMID\$ = TOL

**RUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 80 CASES

DEPENDENT VARIABLE IS VALUE

GROUPING VARIABLE IS

COUNT RANK SUM GROUP

MW-11 40 2170.500

40 1069.500 MW-1S

ANN-WHITNEY U TEST STATISTIC = 1350.500

TROBABILITY IS 0.000
CHI-SQUARE APPROXIMATION = 30.890 WITH

TH 1 DF

THE FOLLOWING RESULTS ARE FOR:

PARAMID\$ = TX

KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES

DEPENDENT VARIABLE IS VALUE GROUPING VARIABLE IS WELL\$

GROUP COUNT RANK SUM

MW-11 41 2272.000 MW-1S 41 1131.000

"ANN-WHITNEY U TEST STATISTIC = 1411.000

ROBABILITY IS 0.000

■HI-SQUARE APPROXIMATION = 28.917 WITH 1 DF

R

SE '0:\2279-111\JAN99\1-14S.SYS'

VARIABLES IN SYSTAT RECT FILE ARE:

WELL\$ PARAMID\$ VALUE LNVALUE HDVALUE

EDIT

ORT PARAMIDS

EGIN SORT

512 CASES SORTED 664 CASES SORTED

SAVING SORTED FILE TO 0:\2279-111\JAN99\1-14S.SYS

ND SORT

SE '0:\2279-111\JAN99\1-14S.SYS'

>NPAR

ISE '0:\2279-111\JAN99\1-14S.SYS'

ARIABLES IN SYSTAT RECT FILE ARE:

WELL\$ PARAMID\$ VALUE LNVALUE HDVALUE HDLNVALU

BY PARAMID\$

>KRUSKAL VALUE * WELL\$

■N 3/15/99 1:55:47 PM 0:\2279-111\JAN99\1-14S.SYS

THE FOLLOWING RESULTS ARE FOR:

PARAMID\$ = BEN

KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 74 CASES

DEPENDENT VARIABLE IS VALUE

__ GROUPING VARIABLE IS WELL\$

GROUP COUNT RANK SUM

MW-14S 33 1454.000

■ MW-1S 41 1321.000

AANN-WHITNEY U TEST STATISTIC = 893.000

PROBABILITY IS 0.003

CHI-SQUARE APPROXIMATION = 9.068 WITH 1 DF

R

THE FOLLOWING RESULTS ARE FOR:

PARAMID\$ = CD

-	DEPENDENT VA	ARIABLE I RIABLE IS	S	VALU: WELL	E \$						
	GROUP	COUNT	RANI	K SUM							
-	MW-14S MW-1S	33 41	1257 1517	7.500 7.500							
PE	ANN-WHITNEY U ROBABILITY IS HI-SQUARE APF	. 0	743						DF		A
TH	HE FOLLOWING PARA	RESULTS MID\$		FOR:							
	RUSKAL-WALLIS DEPENDENT VA GROUPING VAR					VAR	ANCE	FOR	74	CASES	
_	GROUP	COUNT	RANK	SUM							
	MW-14S MW-1S	33 41	1479 1296	.000							
7. R	NN-WHITNEY U OBABILITY IS I-SQUARE APP	0	002					1	DF		R
T _H	E FOLLOWING PARA	RESULTS A									·
	USKAL-WALLIS DEPENDENT VA GROUPING VAR	RIABLE I	S	VALUE	3	VARI	ANCE	FOR	74	CASES	
-	GROUP	COUNT	RANK	SUM							
	MW-14S MW-1S	33 41									
'R	NN-WHITNEY U OBABILITY IS I-SQUARE APP	0	.000					1	DF		R
'Н	E FOLLOWING PARA	RESULTS A									
	USKAL-WALLIS DEPENDENT VA GROUPING VAR	RIABLE I	S	VALUE	;	VARI	ANCE	FOR	74	CASES	
	GROUP	COUNT	RANK	SUM							
	MW-14S MW-1S	33 41	1535 1239	.500 .500							
PR	NN-WHITNEY U OBABILITY IS I-SQUARE APP	0	.000					1	DF	,	R
m7.	E EOLLOWING	DECITE T	, DE E	OP •							

THE FOLLOWING RESULTS ARE FOR: PARAMID\$ = TCE

```
RUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 74 CASES
   DEPENDENT VARIABLE IS
                          VALUE
   GROUPING VARIABLE IS
                          WELL$
     GROUP
               COUNT RANK SUM
   MW-14S
                 33
                      1880.000
   MW-1S
                41
                      895.000
 MANN-WHITNEY U TEST STATISTIC =
                                1319.000
 PROBABILITY IS
                0.000
  HI-SQUARE APPROXIMATION =
                             48.864 WITH
                                             1 DF
  HE FOLLOWING RESULTS ARE FOR:
          PARAMID$
                    = TCR
  RUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 74 CASES
  DEPENDENT VARIABLE IS VALUE
GROUPING VARIABLE IS
                          WELLS
              COUNT RANK SUM
    GROUP
■ MW-14S
                 33
                      1777.000
                       998.000
  MW-1S
                 41
ANN-WHITNEY U TEST STATISTIC =
                                1216.000
 PROBABILITY IS 0.000
 CHI-SQUARE APPROXIMATION =
                             40.326 WITH
                                           1 DF
 THE FOLLOWING RESULTS ARE FOR:
          PARAMID$
                   = TOL
 KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 72 CASES
  DEPENDENT VARIABLE IS VALUE
  GROUPING VARIABLE IS
                          WELL$
    GROUP
              COUNT RANK SUM
                32
                      1336.500
  MW-14S
                40
                      1291.500
  MW-1S
 IANN-WHITNEY U TEST STATISTIC =
                                  808.500
 PROBABILITY IS 0.019
THI-SQUARE APPROXIMATION =
                               5.483 WITH
                                           1 DF
THE FOLLOWING RESULTS ARE FOR:
          PARAMID$ = TX
KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 74 CASES
  DEPENDENT VARIABLE IS
                       VALUE
                          WELL$
  GROUPING VARIABLE IS
              COUNT RANK SUM
    GROUP
                 33
                      1459.000
  MW-14S
                41
                      1316.000
  MW-1S
 MANN-WHITNEY U TEST STATISTIC =
                                 898.000
 PROBABILITY IS
                    0.011
                              6.489 WITH 1 DF
 CHI-SQUARE APPROXIMATION =
```

```
HDLNVALU
 >EDIT
 : ORT PARAMID$
 TEGIN SORT
    512 CASES SORTED
    673 CASES SORTED
  AVING SORTED FILE TO 0:\2279-111\JAN99\1-15S.SYS
 MD SORT
>USE '0:\2279-111\JAN99\1-15S.SYS'
: PAR
 SE '0:\2279-111\JAN99\1-15S.SYS'
 VARIABLES IN SYSTAT RECT FILE ARE:
      WELL$
                PARAMID$ VALUE
                                            LNVALUE
                                                          HDVALUE
   HDLNVALU
>BY PARAMID$
: RUSKAL VALUE * WELLS
MON 3/15/99 1:56:45 PM 0:\2279-111\JAN99\1-15S.SYS
 HE FOLLOWING RESULTS ARE FOR:
         PARAMID$ = BEN
  RUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 75 CASES
DEPENDENT VARIABLE IS VALUE
   GROUPING VARIABLE IS
                          WELL$
    GROUP
             COUNT RANK SUM
  MW-15S
                34
                      1288.000
                     1562.000
  MW-1S
                41
MANN-WHITNEY U TEST STATISTIC =
                                 693.000
 PROBABILITY IS 0.940
 CHI-SQUARE APPROXIMATION =
                             0.006 WITH 1 DF
 THE FOLLOWING RESULTS ARE FOR:
         PARAMID$ = CD
 KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 75 CASES
  DEPENDENT VARIABLE IS VALUE
  GROUPING VARIABLE IS
                         WELL$
             COUNT RANK SUM
    GROUP
 MW-15S
                34
                    1372,000
■ MW-1S
                41
                    1478.000
 1ANN-WHITNEY U TEST STATISTIC =
                                 777.000
ROBABILITY IS 0.210
                            1.570 WITH 1 DF A
 CHI-SQUARE APPROXIMATION =
THE FOLLOWING RESULTS ARE FOR:
          PARAMID$ = CU
**KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 75 CASES
  DEPENDENT VARIABLE IS VALUE
  GROUPING VARIABLE IS
                         WELL$
```

GROUP

MW-15S

MW-1S

COUNT RANK SUM

1222.000

1628.000

34

41

```
ANN-WHITNEY U TEST STATISTIC = 627.000
 PROBABILITY IS
                     0.298
 CHI-SQUARE APPROXIMATION =
                                1.081 WITH 1 DF
 THE FOLLOWING RESULTS ARE FOR:
           PARAMIDS
                    = EBN
 KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 75 CASES
   DEPENDENT VARIABLE IS
                           VALUE
   GROUPING VARIABLE IS
                           WELL$
     GROUP
               COUNT
                       RANK SUM
   MW-15S
                 34
                       1530.000
__ MW-1S
                 41
                       1320.000
  ANN-WHITNEY U TEST STATISTIC =
                                  935.000
  ROBABILITY IS
                    0.007
CHI-SQUARE APPROXIMATION =
                                 7.218 WITH
                                              1 DF
THE FOLLOWING RESULTS ARE FOR:
          PARAMID$
                     = HCR
TUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 75 CASES
   DEPENDENT VARIABLE IS
                         VALUE
   GROUPING VARIABLE IS
                           WELLS
             COUNT
    GROUP
                     RANK SUM
   MW-15S
                 34
                       1309.000
                       1541.000
   MW-1S
                 41
 MANN-WHITNEY U TEST STATISTIC =
                                  714.000
 "ROBABILITY IS
                    0.784
 HI-SQUARE APPROXIMATION =
                                 0.075 WITH
                                              1 DF
 HE FOLLOWING RESULTS ARE FOR:
          PARAMID$
 RUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 75 CASES
DEPENDENT VARIABLE IS
                        VALUE
   GROUPING VARIABLE IS
    GROUP
              COUNT RANK SUM
■ MW-15S
                 34
                       826.500
  MW-1S
                 41
                       2023.500
MANN-WHITNEY U TEST STATISTIC =
 PROBABILITY IS
                     0.000
CHI-SQUARE APPROXIMATION =
                               24.572 WITH
                                              1 DF
 THE FOLLOWING RESULTS ARE FOR:
          PARAMID$ = TCR
KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 75 CASES
  DEPENDENT VARIABLE IS
                         VALUE
  GROUPING VARIABLE IS
                           WELL$
               COUNT RANK SUM
    GROUP
  MW-15S
                 34
                      1413.000
 MW-1S
                 41
                       1437.000
```

MANN-WHITNEY U TEST STATISTIC = 818.000 PROBABILITY IS 0.086 THI-SQUARE APPROXIMATION = 2.957 WITH 1 DF THE FOLLOWING RESULTS ARE FOR: PARAMID\$ = TOLKRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 73 CASES DEPENDENT VARIABLE IS VALUE GROUPING VARIABLE IS GROUP COUNT RANK SUM 1358.000 33 MW-15S ■ MW-1S 40 1343.000 ANN-WHITNEY U TEST STATISTIC = 797.000 ROBABILITY IS 0.069 3.308 WITH 1 DF CHI-SQUARE APPROXIMATION = THE FOLLOWING RESULTS ARE FOR: PARAMID\$ = TX TRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 75 CASES DEPENDENT VARIABLE IS VALUE GROUPING VARIABLE IS WELL\$ COUNT RANK SUM

GROUP MW-15S 34 1410.000

41 1440.000 MW-1S

MANN-WHITNEY U TEST STATISTIC = 815.000 ROBABILITY IS 0.183 HI-SQUARE APPROXIMATION = 1.774 WITH 1 DF

```
N 3/15/99 1:58:53 PM 0:\2279-111\JAN99\1-16.SYS
 THE FOLLOWING RESULTS ARE FOR:
         PARAMID$ = BEN
 KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 69 CASES
  DEPENDENT VARIABLE IS VALUE
__ GROUPING VARIABLE IS
            COUNT RANK SUM
    GROUP
                   1254.000
  MW-16
              28
■ MW-1S
              41 1161.000
 ANN-WHITNEY U TEST STATISTIC =
                                848.000
ROBABILITY IS 0.000
                                                      R
CHI-SQUARE APPROXIMATION =
                         16.909 WITH 1 DF
THE FOLLOWING RESULTS ARE FOR:
         PARAMID$ = CD
KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 69 CASES
  DEPENDENT VARIABLE IS VALUE
  GROUPING VARIABLE IS
                        WELL$
            COUNT RANK SUM
GROUP
  MW-16
                    973.500
              28
  MW-1S
              41 1441.500
MANN-WHITNEY U TEST STATISTIC =
                               567.500
ROBABILITY IS 0.892
HI-SQUARE APPROXIMATION =
                            0.018 WITH 1 DF
 HE FOLLOWING RESULTS ARE FOR:
        PARAMID$ = CU
 RUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 69 CASES
DEPENDENT VARIABLE IS VALUE
                        WELL$
  GROUPING VARIABLE IS
    GROUP
         COUNT RANK SUM
              28
  MW-16
                    966.000
  MW-1S
               41
                    1449.000
MANN-WHITNEY U TEST STATISTIC =
                               560.000
PROBABILITY IS 0.817
 HI-SQUARE APPROXIMATION =
                         0.054 WITH 1 DF
"HE FOLLOWING RESULTS ARE FOR:
        PARAMID$ = EBN
KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 69 CASES
 DEPENDENT VARIABLE IS VALUE
GROUPING VARIABLE IS
```

ANN-WHITNEY U TEST STATISTIC = 1033.500 PROBABILITY IS 0.000

41

COUNT RANK SUM

28 1439.500

975.500

GROUP

MW-16

₩-1S

_HI-SQUARE A	PPROXIMATI	ON =	33 544	שידש	1	DF		P
II SQUARE A	PROXIMALI		33.344	WIIN	1	Dr		~
HE FOLLOWING	RESULTS							
RUSKAL-WALLI DEPENDENT V	ARIABLE I	S VALUI	E	IANCE	FOR	69 C	ASES	
GROUP	COUNT	RANK SUM						
MW-16 MW-1S		946.000 1469.000						
MANN-WHITNEY PROBABILITY I HI-SQUARE AF	S 0	.497			1	DE		N
HI-SQUARE AF	PROXIMATI	ON =	0.461	WIIH	1	Dr		H
THE FOLLOWING	RESULTS							
VRUSKAL-WALLI DEPENDENT V ■ GROUPING VA	ARIABLE I	S VALUE	C	ANCE	FOR	69 C	ASES	
GROUP	COUNT	RANK SUM						
MW-16 MW-1S	28 41	1531.500 883.500						
ANN-WHITNEY ROBABILITY I CHI-SQUARE AP	s 0	.000			1	DF		R
THE FOLLOWING PAR	RESULTS AMID\$							
KRUSKAL-WALLI DEPENDENT V GROUPING VA	ARIABLE I	S VALUE	;	ANCE	FOR	69 C	ASES	
GROUP	COUNT	RANK SUM						
MW-16 MW-18		962.000 1453.000						
MANN-WHITNEY PROBABILITY I	S 0	. 692			1	DF		A
THE FOLLOWING PAR	RESULTS AMID\$							
KRUSKAL-WALLI DEPENDENT V GROUPING VA	ARIABLE I	S VALUE	}	ANCE	FOR	67 CI	ASES	
GROUP	COUNT	RANK SUM						
MW-16 MW-1S	27 40	1227.000 1051.000						

MANN-WHITNEY U TEST STATISTIC = 849.000

THE FOLLOWING RESULTS ARE FOR: PARAMID\$ = TX

Ruskal-wallis one-way analysis of variance for 69 cases

DEPENDENT VARIABLE IS VALUE GROUPING VARIABLE IS WELL\$

GROUP COUNT RANK SUM

MW-16 28 1316.500 MW-1S 41 1098.500

MANN-WHITNEY U TEST STATISTIC = 910.500

ROBABILITY IS 0.000

HI-SQUARE APPROXIMATION = 17.871 WITH 1 DF

SE '0:\2279-111\JAN99\1-3.SYS'

ARIABLES IN SYSTAT RECT FILE ARE:

VALUE WELLS PARAMID\$ T.NVAT.UE HDVALUE

HDLNVALU

DIT

>SORT PARAMID\$

EGIN SORT

512 CASES SORTED

736 CASES SORTED

SAVING SORTED FILE TO 0:\2279-111\JAN99\1-3.SYS

ND SORT

SE '0:\2279-111\JAN99\1-3.SYS'

>NPAR

"SE '0:\2279-111\JAN99\1-3.SYS'

'ARIABLES IN SYSTAT RECT FILE ARE:

VALUE TNVATUE HDVALUE WELL\$ PARAMID\$

HDLNVALU

3Y PARAMID\$

>KRUSKAL VALUE * WELL\$

__N 3/15/99 1:59:41 PM O:\2279-111\JAN99\1-3.SYS

THE FOLLOWING RESULTS ARE FOR:

PARAMID\$ = BEN

KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES

DEPENDENT VARIABLE IS VALUE

GROUPING VARIABLE IS WELL\$

COUNT RANK SUM GROUP

MW-1S 41 1504.000 1899.000 MW-341

MANN-WHITNEY U TEST STATISTIC = 643.000

PROBABILITY IS 0.013 CHI-SQUARE APPROXIMATION = 6.139 WITH 1 DF

THE FOLLOWING RESULTS ARE FOR: PARAMID\$ = CD

GROUPING VARIA	ABLE IS	WELL\$				
GROUP	COUNT RAM	NK SUM				
	41 170 41 170					
ANN-WHITNEY U TO TO THE SOURCE APPROPRIES	1.000)			DF	A
THE FOLLOWING RE	SULTS ARE					
RRUSKAL-WALLIS O DEPENDENT VARI GROUPING VARIA	ABLE IS	VALUE		FOR	82 C	ASES
GROUP C	COUNT RAN	IK SUM				
MW-1S MW-3	41 176 41 163	55.500 87.500				
MANN-WHITNEY U T			904.500			
'ROBABILITY IS "HI-SQUARE APPRO	0.391 = XIMATION	:	0.736 WITH	1	DF	A
'HE FOLLOWING RE	SULTS ARE D\$ = EB					
:RUSKAL-WALLIS C DEPENDENT VARI GROUPING VARIA	ABLE IS	VALUE	OF VARIANCE	FOR	82 C	ASES
GROUP C	OUNT RAN	K SUM				
MW-1S MW-3	41 138 41 201					
MANN-WHITNEY U T			522.500			
PROBABILITY IS HI-SQUARE APPRO	0.002 = XIMATION		9.844 WITH	1	DF	12
THE FOLLOWING RE						·
KRUSKAL-WALLIS O DEPENDENT VARI GROUPING VARIA	ABLE IS	ALYSIS (VALUE WELL\$	OF VARIANCE	FOR	82 C	ASES
GROUP C	OUNT RAN	K SUM				
MW-1S MW-3	41 168 41 172	2.500				
4ANN-WHITNEY U T PROBABILITY IS CHI-SQUARE APPRO	0.794			1	DF	Д
THE FOLLOWING RE	SULTS ARE					

```
DEPENDENT VARIABLE IS VALUE
  GROUPING VARIABLE IS
                         WELL$
    GROUP
              COUNT RANK SUM
 MW-1S
               41 1030.000
  MW-3
                41
                   2373.000
 MANN-WHITNEY U TEST STATISTIC =
                                169.000
PROBABILITY IS
                   0.000
                                                      R
 CHI-SQUARE APPROXIMATION =
                            38.829 WITH 1 DF
 THE FOLLOWING RESULTS ARE FOR:
         PARAMID$ = TCR
 KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES
  DEPENDENT VARIABLE IS VALUE
  GROUPING VARIABLE IS
                         WELL$
    GROUP
             COUNT RANK SUM
  MW-1S
              41 1663.000
                     1740.000
  MW-3
               41
1ANN-WHITNEY U TEST STATISTIC =
                                802.000
 'ROBABILITY IS
                   0.586
THI-SQUARE APPROXIMATION =
                              0.297 WITH
                                         1 DF
HE FOLLOWING RESULTS ARE FOR:
         PARAMID$ = TOL
RUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 80 CASES
  DEPENDENT VARIABLE IS VALUE
  GROUPING VARIABLE IS
             COUNT RANK SUM
    GROUP
  MW-1S
               40
                     1355.500
  MW-3
               40
                     1884.500
MANN-WHITNEY U TEST STATISTIC = 535.500
PROBABILITY IS
                   0.002
 HI-SQUARE APPROXIMATION =
                             9.598 WITH
                                         1 DF
 HE FOLLOWING RESULTS ARE FOR:
         PARAMID$
                  = TX
 RUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES
  DEPENDENT VARIABLE IS VALUE
GROUPING VARIABLE IS
                         WELL$
             COUNT RANK SUM
    GROUP
■ MW-1S
               41
                     1472.500
              41 1930.500
  MW-3
ANN-WHITNEY U TEST STATISTIC = 611.500
 PROBABILITY IS
                   0.024
                                                     R
                         5.103 WITH 1 DF
CHI-SQUARE APPROXIMATION =
>USE '0:\2279-111\JAN99\1-4.SYS'
 "ARIABLES IN SYSTAT RECT FILE ARE:
```

PARAMID\$ VALUE LNVALUE HDVALUE WELL\$ - HDLNVALU

```
__ZDIT
>SORT PARAMID$
 BEGIN SORT
  512 CASES SORTED
    736 CASES SORTED
 SAVING SORTED FILE TO 0:\2279-111\JAN99\1-4.SYS
 ND SORT
JSE '0:\2279-111\JAN99\1-4.SYS'
>NPAR
 JSE '0:\2279-111\JAN99\1-4.SYS'
 'ARIABLES IN SYSTAT RECT FILE ARE:
     WELL$
            PARAMID$ VALUE
                                       LNVALUE
                                                         HDVALUE
 HDLNVALU
 NY PARAMID$
>KRUSKAL VALUE * WELL$
WN 3/15/99 2:00:33 PM 0:\2279-111\JAN99\1-4.SYS
 THE FOLLOWING RESULTS ARE FOR:
         PARAMID$ = BEN
 KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES
  DEPENDENT VARIABLE IS VALUE
  GROUPING VARIABLE IS
                        WELL$
            COUNT RANK SUM
    GROUP
 MW-1S
              41 1100.500
₩-4
               41 2302.500
 ANN-WHITNEY U TEST STATISTIC = 239.500
ROBABILITY IS 0.000
CHI-SQUARE APPROXIMATION =
                            37.261 WITH
                                                      P
                                           1 DF
THE FOLLOWING RESULTS ARE FOR:
         PARAMID$ = CD
TUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES
  DEPENDENT VARIABLE IS VALUE
  GROUPING VARIABLE IS
  GROUP
            COUNT RANK SUM
                      882.500
  MW-1S
               41
  MW-4
               41
                     2520.500
MANN-WHITNEY U TEST STATISTIC = 21.500
 ROBABILITY IS 0.000
 HI-SQUARE APPROXIMATION = 62.135 WITH 1 DF
                                                        R
 HE FOLLOWING RESULTS ARE FOR:
      PARAMID$ = CU
 RUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES
DEPENDENT VARIABLE IS VALUE GROUPING VARIABLE IS WELL$
    GROUP
             COUNT RANK SUM
₩-1S
                41
                     1598.500
  MW-4
               41
                     1804.500
```

737.500

ANN-WHITNEY U TEST STATISTIC =

12

12

THE FOLLOWING RESULTS ARE FOR: PARAMID\$ = EBN

RUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES

DEPENDENT VARIABLE IS VALUE GROUPING VARIABLE IS WELLS

COUNT RANK SUM GROUP

MW-1S 970.000 41 MW-4 41 2433.000

MANN-WHITNEY U TEST STATISTIC = 109.000

ROBABILITY IS 0.000

R HI-SQUARE APPROXIMATION = 47.733 WITH 1 DF

HE FOLLOWING RESULTS ARE FOR:

PARAMID\$ = HCR

RUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES

DEPENDENT VARIABLE IS VALUE GROUPING VARIABLE IS WELL\$

> GROUP COUNT RANK SUM

₩w-1s 861.000 41 MW-4 41 2542.000

MANN-WHITNEY U TEST STATISTIC = 0.000

PROBABILITY IS 0.000

CHI-SQUARE APPROXIMATION = 65.425 WITH 1 DF

THE FOLLOWING RESULTS ARE FOR: PARAMID\$ = TCE

KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES

DEPENDENT VARIABLE IS VALUE GROUPING VARIABLE IS WELL\$

GROUP COUNT RANK SUM

MW-1S41 862.000

₩-4 41 2541.000

IANN-WHITNEY U TEST STATISTIC = 1.000

ROBABILITY IS 0.000

CHI-SQUARE APPROXIMATION = 60.670 WITH 1 DF

THE FOLLOWING RESULTS ARE FOR: PARAMID\$ = TCR

**RUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES

DEPENDENT VARIABLE IS VALUE

GROUPING VARIABLE IS

GROUP COUNT RANK SUM

MW-1S 41 861.000

2542.000 MW-441

ANN-WHITNEY U TEST STATISTIC = 0.000 PROBABILITY IS 0.000 CHI-SQUARE APPROXIMATION = 65.879 WITH 1 DF THE FOLLOWING RESULTS ARE FOR: PARAMID\$ = TOL KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 80 CASES DEPENDENT VARIABLE IS VALUE GROUPING VARIABLE IS WELL\$ GROUP COUNT RANK SUM 40 993.000 MW-1SMW-4 40 2247.000

40.820 WITH 1 DF

■HE FOLLOWING RESULTS ARE FOR:

PARAMID\$

ROBABILITY IS 0.000

THI-SQUARE APPROXIMATION =

ANN-WHITNEY U TEST STATISTIC = 173.000

= TX

RUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES DEPENDENT VARIABLE IS VALUE GROUPING VARIABLE IS WELL\$

GROUP COUNT RANK SUM

MW-1S 41 928.500

MW-4 41 2474.500

MANN-WHITNEY U TEST STATISTIC = 67.500

PROBABILITY IS 0.000

HI-SQUARE APPROXIMATION = 52.893 WITH 1 DF

K

R

```
MON 3/15/99 2:02:33 PM 0:\2279-111\JAN99\1-6B.SYS
 HE FOLLOWING RESULTS ARE FOR:
           PARAMID$
                    = BEN
  RUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 78 CASES
 DEPENDENT VARIABLE IS VALUE
   GROUPING VARIABLE IS
                          WELL$
               COUNT RANK SUM
     GROUP
   MW-1S
                41 1589.500
   MW-6B
                37
                      1491.500
 MANN-WHITNEY U TEST STATISTIC =
                                 728.500
 PROBABILITY IS
                  0.644
  HI-SQUARE APPROXIMATION =
                               0.214 WITH 1 DF
 THE FOLLOWING RESULTS ARE FOR:
          PARAMID$
 "RUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 78 CASES
   DEPENDENT VARIABLE IS VALUE
 GROUPING VARIABLE IS
                          WELL$
     GROUP
              COUNT RANK SUM
                     1578.500
  MW-1S
                41
   MW-6B
                37
                      1502.500
 ANN-WHITNEY U TEST STATISTIC =
                                 717.500
ROBABILITY IS
                0.539
                              0.378 WITH
 CHI-SQUARE APPROXIMATION =
                                          1 DF
 THE FOLLOWING RESULTS ARE FOR:
          PARAMID$
                   = CU
 KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 78 CASES
   DEPENDENT VARIABLE IS VALUE
   GROUPING VARIABLE IS
                          WELL$
    GROUP
             COUNT RANK SUM
   MW-1S
                41
                      1712.500
                37
  MW-6B
                      1368.500
 MANN-WHITNEY U TEST STATISTIC =
                                 851.500
 PROBABILITY IS 0.164
= CHI-SQUARE APPROXIMATION =
                               1.935 WITH
                                            1 DF
THE FOLLOWING RESULTS ARE FOR:
          PARAMID$
                   = EBN
 KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 78 CASES
  DEPENDENT VARIABLE IS VALUE
   GROUPING VARIABLE IS
                          WELL$
```

MANN-WHITNEY U TEST STATISTIC = 593.000

COUNT RANK SUM

1454.000

1627.000

41

37

GROUP

MW-1S

MW-6B

```
'ROBABILITY IS
                     0.075
-HI-SQUARE APPROXIMATION =
                               3.172 WITH 1 DF
-HE FOLLOWING RESULTS ARE FOR:
          PARAMIDS
                   = HCR
RUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 78 CASES
   DEPENDENT VARIABLE IS
                        VALUE
   GROUPING VARIABLE IS
                          WELL$
    GROUP
             COUNT
                     RANK SUM
  MW-1S
                 41
                      1638.000
   MW-6B
                 37
                      1443.000
 MANN-WHITNEY U TEST STATISTIC =
                                  777.000
 PROBABILITY IS 0.775
  HI-SQUARE APPROXIMATION =
                               0.082 WITH
                                             1 DF
 HE FOLLOWING RESULTS ARE FOR:
          PARAMID$ = TCE
 RUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 78 CASES
                        VALUE
  DEPENDENT VARIABLE IS
GROUPING VARIABLE IS
                          WELL$
             COUNT RANK SUM
    GROUP
MW-1S
                41
                      1785.000
                37
                      1296.000
  MW-6B
ANN-WHITNEY U TEST STATISTIC =
                                   924.000
PROBABILITY IS 0.098
CHI-SQUARE APPROXIMATION =
                                2.746 WITH
                                           1 DF
THE FOLLOWING RESULTS ARE FOR:
         PARAMID$ = TCR
KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 78 CASES
  DEPENDENT VARIABLE IS VALUE
  GROUPING VARIABLE IS
                          WELL$
    GROUP
              COUNT RANK SUM
  MW-1S
                41
                      1451.000
___MW-6B
                      1630.000
                37
 ANN-WHITNEY U TEST STATISTIC =
                                  590.000
 ROBABILITY IS 0.025
THI-SQUARE APPROXIMATION =
                               5.016 WITH
                                             1 DF
HE FOLLOWING RESULTS ARE FOR:
          PARAMID$ = TOL
ERUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 76 CASES
  DEPENDENT VARIABLE IS
                        VALUE
  GROUPING VARIABLE IS
                          WELL$
    GROUP
              COUNT RANK SUM
  MW-1S
                40
                      1367.500
```

MW-6B

36

1558.500

ANN-WHITNEY U TEST STATISTIC = 547.500 PROBABILITY IS 0.042 CHI-SQUARE APPROXIMATION = 4.142 WITH 1 DF THE FOLLOWING RESULTS ARE FOR: PARAMID\$ KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 78 CASES DEPENDENT VARIABLE IS VALUE GROUPING VARIABLE IS WELL\$ GROUP COUNT RANK SUM MW-1S 41 1486.000 1595.000 _ MW-6B 37 ANN-WHITNEY U TEST STATISTIC = 625.000 ROBABILITY IS 0.148 THI-SQUARE APPROXIMATION = 2.088 WITH 1 DF SE '0:\2279-111\JAN99\1-7.SYS' VARIABLES IN SYSTAT RECT FILE ARE: PARAMID\$ VALUE LNVALUE HDVALUE HDLNVALU >EDIT : ORT PARAMID\$ EGIN SORT 512 CASES SORTED 736 CASES SORTED AVING SORTED FILE TO 0:\2279-111\JAN99\1-7.SYS ND SORT ₩SE '0:\2279-111\JAN99\1-7.SYS' NPAR × SE '0:\2279-111\JAN99\1-7.SYS' ARIABLES IN SYSTAT RECT FILE ARE: WELL\$ PARAMID\$ VALUE LNVALUE HDVALUE HDLNVALU Y PARAMID\$ >KRUSKAL VALUE * WELL\$ MON 3/15/99 2:03:41 PM 0:\2279-111\JAN99\1-7.SYS "HE FOLLOWING RESULTS ARE FOR: PARAMID\$ = BEN KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES DEPENDENT VARIABLE IS VALUE GROUPING VARIABLE IS WELL\$ COUNT RANK SUM GROUP MW-1S 1374.500 41 MW-7 41 2028.500 4ANN-WHITNEY U TEST STATISTIC = 513.500 PROBABILITY IS 0.000 13.506 WITH 1 DF CHI-SQUARE APPROXIMATION =

THE FOLLOWING RESULTS ARE FOR:

PARAMID\$ = CD

DEPENDENT VA					
GROUP	COUNT	RANK SUM			
■ MW-1S MW-7	41 41	1666.000 1737.000			
PROBABILITY IS	5 (0.634			A
THE FOLLOWING	RESULTS MID\$				
KRUSKAL-WALLIS DEPENDENT VA GROUPING VAR	RIABLE I	S VALU	E	FOR 82	CASES
GROUP	COUNT	RANK SUM			
MW-1S MW-7		1510.000 1893.000			
ANN-WHITNEY U ROBABILITY IS CHI-SQUARE APP	^	020			A
THE FOLLOWING PARA	RESULTS MID\$				
RUSKAL-WALLIS DEPENDENT VA GROUPING VAR	RIABLE I	S VALUE	E	FOR 82	CASES
GROUP	COUNT	RANK SUM			
MW-1S MW-7		1407.500 1995.500			
MANN-WHITNEY U ROBABILITY IS HI-SQUARE APP	0	.004			lo.
III SQUAKU AFF	NOT TALLET	ON -	0.433 WIII	1 51	K
'HE FOLLOWING PARA	RESULTS MID\$				
RUSKAL-WALLIS DEPENDENT VA GROUPING VAR	RIABLE I	S VALUE	E	FOR 82	CASES
GROUP	COUNT	RANK SUM			
MW-1S MW-7		1681.000 1722.000			
MANN-WHITNEY U PROBABILITY IS CHI-SQUARE APP	0	.778			Ĥ
					.,

THE FOLLOWING RESULTS ARE FOR: PARAMID\$ = TCE

(RUSKAL-WALLIS DEPENDENT VA GROUPING VAR	RIABLE IS	VALUE	F VARIANCE	FOR 82 CASES	
GROUP	COUNT RA	NK SUM			
MW-1S MW-7	41 9 41 24	11.000 92.000			
MANN-WHITNEY UPROBABILITY IS CHI-SQUARE APP	0.00	0		1 DF	R
HE FOLLOWING	RESULTS ARE MID\$ = T				,
(RUSKAL-WALLIS DEPENDENT VA GROUPING VAR	RIABLE IS	VALUE	F VARIANCE	FOR 82 CASES	
GROUP	COUNT RA	NK SUM			
MW-1S MW-7	41 16 41 17				
AANN-WHITNEY U PROBABILITY IS CHI-SQUARE APP	0.21	В		1 DF	A
THE FOLLOWING PARA	RESULTS ARE MID\$ = To				, ,
KRUSKAL-WALLIS DEPENDENT VA GROUPING VAR	RIABLE IS	VALUE	VARIANCE	FOR 80 CASES	
GROUP	COUNT RA	NK SUM			
MW-1s MW-7	40 14 40 18	11.000 29.000			
4ANN-WHITNEY U PROBABILITY IS CHI-SQUARE APP	0.01	2		1 DF	R
THE FOLLOWING PARA	RESULTS ARE MID\$ = T				
RUSKAL-WALLIS DEPENDENT VA	RIABLE IS	VALUE	VARIANCE	FOR 82 CASES	
GROUP	COUNT RAI	NK SUM			
MW-1S MW-7		79.000 24.000			
MANN-WHITNEY U PROBABILITY IS CHI-SQUARE APP	0.21	€		1 DF	A
USE 'O:\2279-1 VARIABLES IN S WELL\$		FILE ARE:	VALUE	LNVALUE	HDVALUE

```
HDLNVALU
 >EDIT
  _ORT PARAMID$
 BEGIN SORT
    512 CASES SORTED
    736 CASES SORTED
  AVING SORTED FILE TO 0:\2279-111\JAN99\1-9.SYS
 END SORT
 >USE '0:\2279-111\JAN99\1-9.SYS'
 SE '0:\2279-111\JAN99\1-9.SYS'
 VARIABLES IN SYSTAT RECT FILE ARE:
               PARAMID$ VALUE
                                            LNVALUE
                                                          HDVALUE
   HDLNVALU
>BY PARAMID$
: RUSKAL VALUE * WELL$
MON 3/15/99 2:04:55 PM 0:\2279-111\JAN99\1-9.SYS
  HE FOLLOWING RESULTS ARE FOR:
      PARAMID$ = BEN
 RUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES
DEPENDENT VARIABLE IS VALUE
  GROUPING VARIABLE IS
                          WELL$
    GROUP
              COUNT RANK SUM
                41 1133.000
41 2270.000
   MW-1S
   MW - 9
                41
MANN-WHITNEY U TEST STATISTIC = 272.000
 PROBABILITY IS 0.000
                          32.509 WITH 1 DF
 CHI-SQUARE APPROXIMATION =
 THE FOLLOWING RESULTS ARE FOR:
          PARAMID$ = CD
 KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES
  DEPENDENT VARIABLE IS VALUE
 _ GROUPING VARIABLE IS
                          WELL$
    GROUP
             COUNT RANK SUM
  MW-1S
                41
                      1666.000
₩-9
                    1737.000
               41
 MANN-WHITNEY U TEST STATISTIC =
                                805.000
PROBABILITY IS 0.634
 CHI-SQUARE APPROXIMATION =
                            0.227 WITH 1 DF
 THE FOLLOWING RESULTS ARE FOR:
          PARAMID$ = CU
KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES
   DEPENDENT VARIABLE IS VALUE
   GROUPING VARIABLE IS
                         WELL$
             COUNT RANK SUM
   GROUP
```

MW-1S

MW-9

41

41

1778.000 1625.000

```
WMENN-WHITNEY U TEST STATISTIC = 917.000
 PROBABILITY IS
                   0.317
                           1.003 WITH 1 DF
 CHI-SQUARE APPROXIMATION =
 THE FOLLOWING RESULTS ARE FOR:
                   = EBN
          PARAMID$
 KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES
   DEPENDENT VARIABLE IS VALUE
   GROUPING VARIABLE IS
                          WELL$
    GROUP
              COUNT RANK SUM
  MW-1S
               41
                    1070.500
                      2332.500
 ₩ MW-9
               41
  ANN-WHITNEY U TEST STATISTIC =
                                209.500
 COBABILITY IS 0.000
 CHI-SQUARE APPROXIMATION =
                              35.839 WITH 1 DF
 THE FOLLOWING RESULTS ARE FOR:
          PARAMID$ = HCR
TRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES
   DEPENDENT VARIABLE IS VALUE
  GROUPING VARIABLE IS
                         WELL$
              COUNT RANK SUM
   GROUP
  MW-1S
               41 1518.500
               41
                      1884.500
  MW-9
MANN-WHITNEY U TEST STATISTIC =
                               657.500
 ROBABILITY IS 0.027
                            4.900 WITH 1 DF
 HI-SQUARE APPROXIMATION =
 HE FOLLOWING RESULTS ARE FOR:
         PARAMID$
 RUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES
DEPENDENT VARIABLE IS VALUE
  GROUPING VARIABLE IS
                         WELL$
    GROUP
             COUNT RANK SUM
  MW-1S
                41
                      870.500
                      2532.500
  MW-9
                41
MANN-WHITNEY U TEST STATISTIC =
                                  9.500
 PROBABILITY IS
               0.000
 CHI-SQUARE APPROXIMATION =
                              59.431 WITH
                                            1 DF
THE FOLLOWING RESULTS ARE FOR:
         PARAMID$
                   = TCR
KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 82 CASES
  DEPENDENT VARIABLE IS VALUE
  GROUPING VARIABLE IS
                         WELL$
    GROUP
             COUNT RANK SUM
                      1498.000
  MW-1S
                41
 MW-9
                41
                      1905.000
```

MANN-WHITNEY U TEST STATISTIC = 637.000
PROBABILITY IS 0.014
CHI-SQUARE APPROXIMATION = 6.054 WITH 1 DF

R

THE FOLLOWING RESULTS ARE FOR: PARAMID\$ = TOL

KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE FOR 80 CASES DEPENDENT VARIABLE IS VALUE

GROUPING VARIABLE IS WELL\$

GROUP COUNT RANK SUM

MW-1S 40 1032.000

MW-9 40 2208.000

1ANN-WHITNEY U TEST STATISTIC = 212.000 ■PROBABILITY IS 0.000

CHI-SQUARE APPROXIMATION = 35.869 WITH 1 DF

THE FOLLOWING RESULTS ARE FOR:
PARAMID\$ = TX

**Rruskal-wallis one-way analysis of variance for 82 cases dependent variable is value grouping variable is well\$

MW-1S 41 1106.000 MW-9 41 2297.000

MANN-WHITNEY U TEST STATISTIC = 245.000
PROBABILITY IS 0.000

HI-SQUARE APPROXIMATION = 32.250 WITH 1 DF

Appendix E-3 Parametric ANOVA Results

TSE '0:\2279-111\JAN99\1-11.SYS' VARIABLES IN SYSTAT RECT FILE ARE:

WELL\$ PARAMID\$ VALUE LNVALUE HDVALUE

HDLNVALU

>SELECT PARAMID\$ ="TCE"

IGLH

₩ATEGORY WELL\$

>ANOVA HDVALUE 'RINT=MEDIUM

STIMATE

N 3/15/99 2:07:45 PM 0:\2279-111\JAN99\1-11.SYS

EVELS ENCOUNTERED DURING PROCESSING ARE:

WELL\$

MW-11 MW-1S

PEP VAR: HDVALUE N: 82 MULTIPLE R: 0.583 SQUARED MULTIPLE R: 0.340

ANALYSIS OF VARIANCE

OURCE SUM-OF-SQUARES DF MEAN-SQUARE F-RATIO P

Well\$ 623689.292 1 623689.292 41.275 0.000 ${\cal R}$

RROR 1208855.403 80 15110.693

TEAST SQUARES MEANS.

LS MEAN SE N
WELL\$ =MW-11 187.073 19.198 41

WELL\$ =MW-1S 12.649 19.198 41

'RINT=SHORT

COVAR WELL\$

`_NOVA HDLNVALU

'RINT=MEDIUM

STIMATE

)N 3/15/99 2:08:11 PM 0:\2279-111\JAN99\1-11.SYS

N:

EVELS ENCOUNTERED DURING PROCESSING ARE:

WELL\$

MW-11 MW-1S

DEP VAR: HDLNVALU

82 MULTIPLE R: 0.693 SQUARED MULTIPLE R: 0.480

R

ANALYSIS OF VARIANCE

SOURCE SUM-OF-SQUARES DF MEAN-SQUARE F-RATIO P

WELL\$ 90.941 1 90.941 73.860 0.000

ERROR 98.502 80 1.231

LEAST SQUARES MEANS.

LS MEAN SE N

WELL\$ =MW-11 4.579 0.173 41

WELL\$ =MW-1S 2.472 0.173 41

>PRINT=SHORT

.

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-

ELECT PARAMID\$ ="TCE" >CATEGORY WELL\$ COVAR NOVA HDVALUE >PRINT=MEDIUM >ESTIMATE

MON 3/15/99 2:09:16 PM 0:\2279-111\JAN99\1-14S.SYS LEVELS ENCOUNTERED DURING PROCESSING ARE: IELL\$

MW-14S MW-1S

EP VAR: HDVALUE 74 MULTIPLE R: 0.670 SQUARED MULTIPLE R: 0.448 N:

ANALYSIS OF VARIANCE

SOURCE SUM-OF-SQUARES DF MEAN-SQUARE F-RATIO Ρ ELL\$ 29636.050 1 29636.050 58.547 0.000 ERROR 36445.850 72 506.192

EAST SQUARES MEANS.

LS MEAN SE N WELL\$ =MW-14S52.909 3.917 33 WELL\$ ≃MW-1S 12.649 3.514 41

>PRINT=SHORT

ATEGORY WELL\$

OVAR MNOVA HDLNVALU

>PRINT=MEDIUM

` "STIMATE

MON 3/15/99 2:09:47 PM 0:\2279-111\JAN99\1-14S.SYS VEVELS ENCOUNTERED DURING PROCESSING ARE: ELL\$

__MW-14S MW-1S

DEP VAR: HDLNVALU N: 74 MULTIPLE R: 0.778 SQUARED MULTIPLE R: 0.605

ANALYSIS OF VARIANCE

SOURCE SUM-OF-SQUARES DF MEAN-SQUARE F-RATIO ₽ 31.026 0.000 ELL\$ 1 31.026 110.245 20.262 72 0.281 ERROR

LEAST SQUARES MEANS.

LS MEAN SE N 0.092 33 WELL\$ =MW-14S3.775 WELL\$ =MW-1S2.472 0.083 41

JSE '0:\2279-111\JAN99\1-15S.SYS'

WARIABLES IN SYSTAT RECT FILE ARE:

WELL\$ PARAMID\$ VALUE LNVALUE HDVALUE

HDLNVALU

ELECT PARAMID\$ ="TCE"

>CATEGORY WELL\$

COVAR

ANOVA HDVALUE

>PRINT=MEDIUM

>ESTIMATE

MON 3/15/99 2:10:41 PM 0:\2279-111\JAN99\1-15S.SYS

LEVELS ENCOUNTERED DURING PROCESSING ARE:

™ELL\$

MW-15S MW-1S

EP VAR: HDVALUE N: 75 MULTIPLE R: 0.493 SQUARED MULTIPLE R: 0.243

ANALYSIS OF VARIANCE

SOURCE SUM-OF-SQUARES DF MEAN-SQUARE F-RATIO

725.758 725.758 23.419 0.000 "ELL\$

RROR 2262.262 73 30,990

EAST SQUARES MEANS.

LS MEAN SE N WELL\$ =MW-15S 6.400 0.955 34

0.869 WELL\$ =MW-1S 12.649 41

#RINT=SHORT

> CATEGORY WELL\$

OVAR

MOVA HDLNVALU

>PRINT=MEDIUM

>FSTIMATE

MON 3/15/99 2:10:55 PM O:\2279-111\JAN99\1-15S.SYS

LEVELS ENCOUNTERED DURING PROCESSING ARE:

ELL\$

MW-15S MW-1S

TEP VAR: HDLNVALU 75 MULTIPLE R: 0.555 SQUARED MULTIPLE R: 0.308 N:

 \mathcal{R}

ANALYSIS OF VARIANCE

SOURCE SUM-OF-SQUARES DF MEAN-SQUARE F-RATIO

0.000 ELL\$ 14.091 32.451 14.091 1

ERROR 31.698 73 0.434

TEAST SQUARES MEANS.

SE LS MEAN 1.602 0.113 34 WELL\$ =MW-1S 2.472 0.103 41

RINT=SHORT

```
>SELECT PARAMID$ ="TCE"
> "ATEGORY WELL$
> OVAR
>NOVA HDVALUE
>PRINT=MEDIUM
>FSTIMATE
MON 3/15/99 2:11:44 PM 0:\2279-111\JAN99\1-16.SYS
 LEVELS ENCOUNTERED DURING PROCESSING ARE:
  ELL$
MW-1S
TEP VAR: HDVALUE N: 69 MULTIPLE R: 0.727 SQUARED MULTIPLE R: 0.528
                       ANALYSIS OF VARIANCE
                             DF MEAN-SQUARE
                                                  F-RATIO
                                                               Ρ
 SOURCE
             SUM-OF-SQUARES
                                                               0.000
  ELL$
                 17644.463
                            1
                                   17644.463
                                                  74.974
 ERROR
                 15767.837
                                     235.341
                             67
LEAST SQUARES MEANS.
                                 LS MEAN
                                                  SE
                                                          N
                                  45.214
                                                2.899
                                                          28
      WELL$
              =MW-16
                                  12,649
                                                2.396
                                                          41
      WELL$
              =MW-1S
>PRINT=SHORT
 ATEGORY WELL$
OVAR
>ANOVA HDLNVALU
>PRINT=MEDIUM
 STIMATE
MON 3/15/99 2:11:53 PM 0:\2279-111\JAN99\1-16.SYS
 EVELS ENCOUNTERED DURING PROCESSING ARE:
 ELL$
₩-16
              MW-1S
DEP VAR:HDLNVALU
                      N:
                              69 MULTIPLE R: 0.773 SQUARED MULTIPLE R: 0.598
                       ANALYSIS OF VARIANCE
 SOURCE
             SUM-OF-SQUARES
                             DF MEAN-SQUARE
                                                  F-RATIO
                                                               Ρ
                    23.517
                              1
                                      23.517
                                                  99.570
                                                               0.000
 VELL$
                    15.825
                             67
                                     0.236
 ERROR
LEAST SQUARES MEANS.
                                 LS MEAN
                                                          N
                                   3.661
                                                0.092
                                                          28
       WELL$
              =MW-16
```

0.076

41

2.472

WELL\$

=MW-1S

>PRINT=SHORT

: 'SE 'O:\2279-111\JAN99\1-3.SYS'

ARIABLES IN SYSTAT RECT FILE ARE:

WELL\$ HDLNVALU

PARAMID\$

VALUE

LNVALUE

HDVALUE

R

R

ELECT PARAMID\$ ="TCE"

>CATEGORY WELL\$

OVAR

NOVA HDVALUE

RINT=MEDIUM

>ESTIMATE

■N 3/15/99 2:13:13 PM 0:\2279-111\JAN99\1-3.SYS

LEVELS ENCOUNTERED DURING PROCESSING ARE:

WELL\$

MW-1S

MW-3

EP VAR: HDVALUE

N: 82 MULTIPLE R: 0.560 SQUARED MULTIPLE R: 0.314

ANALYSIS OF VARIANCE

OURCE SUM-OF-SQUARES DF MEAN-SQUARE F-RATIO Ρ

WELL\$ 25144.010 1 25144.010 36.616 0.000

RROR 54935.927 80 686.699

__EAST SQUARES MEANS.

LS MEAN SE N 4.093 WELL\$ **=MW-1**S 12.649 41

WELL\$ =MW-347.671 4.093 41

RINT=SHORT

>CATEGORY WELL\$

: OVAR

NOVA HDLNVALU

>PRINT=MEDIUM >ESTIMATE

MON 3/15/99 2:13:25 PM 0:\2279-111\JAN99\1-3.SYS

LEVELS ENCOUNTERED DURING PROCESSING ARE:

TELL\$ MW-1S

MW-3

EP VAR: HDLNVALU N: 82 MULTIPLE R: 0.657 SQUARED MULTIPLE R: 0.431

ANALYSIS OF VARIANCE

SOURCE SUM-OF-SQUARES DF MEAN-SQUARE F-RATIO P

25.061 25.061 60.597 0.000 ELL\$ 1

ERROR 33.085 80 0.414

EAST SQUARES MEANS.

LS MEAN SE N
WELL\$ =MW-1S 2.472 0.100 41
WELL\$ =MW-3 3.578 0.100 41

: RINT=SHORT

.

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```
ELECT PARAMID$ ="TCE"
>CATEGORY WELL$
>COVAR
 NOVA HDVALUE
■ RINT=MEDIUM
>ESTIMATE
N 3/15/99 2:14:12 PM O:\2279-111\JAN99\1-4.SYS
LEVELS ENCOUNTERED DURING PROCESSING ARE:
 WELL$
 MW-1S
               MW-4
                                82 MULTIPLE R: 0.842 SQUARED MULTIPLE R: 0.709
 DEP VAR: HDVALUE
                       N:
                        ANALYSIS OF VARIANCE
                                                                  Ρ
OURCE
              SUM-OF-SQUARES
                              DF MEAN-SQUARE
                                                   F-RATIO
                 705391.575
                                    705391.575
                                                   194.824
                                                                 0.000
 WELL$
 RROR
                             80
                                      3620.653
                 289652.244
 EAST SQUARES MEANS.
                                  LS MEAN
                                                    SE
                                                             N
       WELL$
              =MW-1S
                                   12.649
                                                  9.397
                                                            41
                                  198.146
                                                  9.397
                                                            41
              =MW-4
       WELLS
RINT=SHORT
>CATEGORY WELL$
 OVAR
 NOVA HDLNVALU
₹RINT=MEDIUM
>ESTIMATE
■N 3/15/99 2:14:23 PM 0:\2279-111\JAN99\1-4.SYS
 LEVELS ENCOUNTERED DURING PROCESSING ARE:
 WELL$
 MW-1S
              MW-4
EP VAR: HDLNVALU
                       N:
                              82 MULTIPLE R: 0.927 SQUARED MULTIPLE R: 0.860
                        ANALYSIS OF VARIANCE
                                                                  Ρ
SOURCE
              SUM-OF-SQUARES
                              DF MEAN-SQUARE
                                                   F-RATIO
                    145.776
                              1
                                       145.776
                                                   491.197
                                                                 0.000
 ™ELL$
                     23.742
                              80
                                         0.297
RROR
__EAST SQUARES MEANS.
                                   LS MEAN
                                                     SE
                                                             N
                                                  0.085
       WELL$
               =MW-1S
                                    2.472
                                                            41
```

5.139

0.085

41

WELL\$

=MW-4

>USE '0:\2279-111\JAN99\1-6B.SYS' VARIABLES IN SYSTAT RECT FILE ARE: WELL\$ PARAMID\$ VALUE LNVALUE HDVALUE HDLNVALU >SELECT PARAMID\$ ="TCE" > ATEGORY WELL\$ **OVAR** >ANOVA HDVALUE >PRINT=MEDIUM : STIMATE MON 3/15/99 2:15:18 PM 0:\2279-111\JAN99\1-6B.SYS EVELS ENCOUNTERED DURING PROCESSING ARE: ELL\$ MW-6B 78 MULTIPLE R: 0.146 SQUARED MULTIPLE R: 0.021 DEP VAR: HDVALUE N: ANALYSIS OF VARIANCE SOURCE SUM-OF-SOUARES DF MEAN-SQUARE F-RATIO P 299.496 1 299.496 1.650 0.203 ELL\$ ERROR 13792.195 76 181,476 LEAST SQUARES MEANS. LS MEAN SE N WELL\$ =MW-1S 2.104 41 12.649 WELL\$ =MW-6B 16.573 2.215 37 >PRINT=SHORT :ATEGORY WELL\$ >ANOVA HDLNVALU 'RINT=MEDIUM STIMATE "ON 3/15/99 2:15:29 PM O:\2279-111\JAN99\1-6B.SYS LEVELS ENCOUNTERED DURING PROCESSING ARE: WIELL\$ MW-1S MW-6B DEP VAR: HDLNVALU N: 78 MULTIPLE R: 0.144 SQUARED MULTIPLE R: 0.021 ANALYSIS OF VARIANCE **SOURCE** SUM-OF-SQUARES DF MEAN-SQUARE F-RATIO 1.164 1.599 0.210 WELL\$ 1.164 1 ERROR 55.312 76 0.728

LEAST SQUARES MEANS.

LS MEAN SE N WELL\$ =MW-1S 2.472 0.133 41

WELL\$ 2.228 =MW-6B0.140 37

RINT=SHORT

>USE '0:\2279-111\JAN99\1-7.SYS'

ARIABLES IN SYSTAT RECT FILE ARE:

WELL\$ PARAMID\$ VALUE LNVALUE HDVALUE

HDLNVALU

ELECT PARAMID\$ ="TCE"

SCATEGORY WELL\$

>COVAR

NOVA HDVALUE 'RINT=MEDIUM

₹STIMATE

: NN 3/15/99 2:15:54 PM O:\2279-111\JAN99\1-7.SYS

EVELS ENCOUNTERED DURING PROCESSING ARE:

WELL\$

MW-1S MW-7

EP VAR: HDVALUE N: 82 MULTIPLE R: 0.694 SQUARED MULTIPLE R: 0.481

ANALYSIS OF VARIANCE

OURCE SUM-OF-SQUARES DF MEAN-SQUARE F-RATIO Ρ

WELL\$ 60601.618 60601.618 74.273 0.000 1

RROR 65274.147 80 815.927

EAST SQUARES MEANS.

LS MEAN SE WELL\$ =MW-1S12.649 4.461 41

67.020 WELL\$ =MW-74.461 41

'RINT=SHORT

>CATEGORY WELL\$

>COVAR

ANOVA HDLNVALU

RINT=MEDIUM >ESTIMATE

N 3/15/99 2:16:06 PM O:\2279-111\JAN99\1-7.SYS LEVELS ENCOUNTERED DURING PROCESSING ARE:

WELL\$

MW-1S MW-7

82 MULTIPLE R: 0.756 SQUARED MULTIPLE R: 0.571 DEP VAR: HDLNVALU N:

ANALYSIS OF VARIANCE

30URCE SUM-OF-SQUARES DF MEAN-SQUARE F-RATIO Ρ

0.000 WELL\$ 45.260 1 45.260 106.688

ERROR 33.938 80 0.424 LEAST SQUARES MEANS.

LS MEAN SE N WELL\$ =MW-1S2.472 0.102 41 WELL\$ =MW-73.958 0.102 41

> RINT=SHORT

SE '0:\2279-111\JAN99\1-9.SYS' VARIABLES IN SYSTAT RECT FILE ARE:

WELL\$ PARAMID\$ VALUE LNVALUE HDVALUE

HDLNVALU

>SELECT PARAMID\$ ="TCE"

ATEGORY WELL\$:OVAR ANOVA HDVALUE >PRINT=MEDIUM CSTIMATE

MON 3/15/99 2:16:31 PM 0:\2279-111\JAN99\1-9.SYS

LEVELS ENCOUNTERED DURING PROCESSING ARE: IELL\$

■ MW-1S

MW-9

DEP VAR: HDVALUE 82 MULTIPLE R: 0.603 SQUARED MULTIPLE R: 0.363 N:

ANALYSIS OF VARIANCE

Ρ SOURCE SUM-OF-SQUARES DF MEAN-SQUARE F-RATIO 1 2514190.860 0.000 VELL\$ 2514190.860 45.609

4409988.244 80 55124.853 ERROR

LEAST SOUARES MEANS.

LS MEAN 12.649 36.668 41 WELL\$ =MW-1S362.854 36.668 41 WELL\$ =MW-9

>PRINT=SHORT

CATEGORY WELL\$ COVAR >ANOVA HDLNVALU >PRINT=MEDIUM ESTIMATE

MON 3/15/99 2:16:40 PM 0:\2279-111\JAN99\1-9.SYS LEVELS ENCOUNTERED DURING PROCESSING ARE:

WELL\$ ₩ MW-1S

MW-9

DEP VAR: HDLNVALU N: 82 MULTIPLE R: 0.833 SQUARED MULTIPLE R: 0.694

OURCE		SUM-OF-SQUARES		DF	MEAN-SQUARE	F-RATIO		P	
WELL\$			157.307		157.307	181.107	7	0.000	
RROR			69.487		0.869				1
THE STATE OF THE S									
EAST	SQUARES	MEANS	S.						
***	WELLS	=MW-1	ıe		LS MEAN 2.472	SE 0.146	N 41		
	AFTT3	-MM-1	1.5		2.4/2	0.140	41		
·	WELL\$	=MW-9)		5.242	0.146	41		

'RINT=SHORT